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THE SPREAD OF BACTERIAL INFECTIONS FROM THE NASAL AND NASOPHARYNGEAL CAVITIES BY WAY OF LYMPHATIC CHANNELS. *

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Bacteriology of the Healthy Nasal and Postnasal Cavities.—It will not be out of place to make a brief reference to the bacterial flora of the normal nasal, nasopharyngeal, and accessory nasal cavities, and to draw attention to the bacteriology of the common catarrhal conditions of the upper respiratory passages. In spite of certain conflicting opinions regarding the relative prevalence and virulence of microorganisms in the healthy nasal passages, the investigations of Park and Wright, St. Clair Thomson and Hewlett, Hasslauer, Viollet, Paulsen, Strauss, von Besser, Lewis and Logan Turner and others have clearly demonstrated their existence under normal conditions.

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In the researches of Lewis and myself,[1] twenty-six specimens were examined from sixteen persons and only three were sterile. Thirteen were monoorganismal, nine showed two varieties of organism, while in one specimen a combination of three varieties of bacteria was met with. The pneumococcus was present in four, the micrococcus pyogenes in thirteen, and streptococci in six specimens. Other organisms such as the bacillus of Hoffmann, Friedländer's bacillus, B. mesentericus, B. proteus, and B. aureus were also isolated. In only two of the healthy cavities were the organisms pathogenic, the streptococcus pyogenes in one proving fatal to a rabbit in fourteen days. Allen[2] examined twenty normal noses and none of them were sterile; the micrococcus pyogenes var. albus and aureus were isolated in fifteen; Gramcocci of the pseudocatarrhalis group were found in four.

With regard to the postnasal space, we find that C. E. West in his recent researches upon the bacteriology of chronic nasopharyngeal catarrh, which will be referred to presently, formed the opinion that the bacterial flora in health differed very little from that found in chronic catarrh. Reference will be made later to the occurrence of the tubercle bacillus in the normal nasal cavities.

The Healthy Accessory Sinuses.—Bacteriologic investigation of the healthy accessory sinuses does not seem to have been carried out during life, the difficulty of doing so without contaminating the swab employed being obvious. Törne[3] has examined the frontal and maxillary sinuses in thirty-six cadavera; in twenty-two the cultures were made within two and a half hours of death, and in all of them the sinuses were found sterile. Of the remaining fourteen cases examined from three to twenty-five hours after death, seven were still sterile and seven contained bacteria. There is thus evidence to show that these sinuses at any rate are free from bacteria during life. E. Fränkel[4] had previously examined the normal accessory sinuses, some within eight to ten hours, and all within twenty-four hours, after death. In twenty-eight cadavera thirteen were quite sterile, while of the remainder some contained one, others several forms of bacteria. The pneumococcus and varieties of the micrococcus pyogenes were found. Fränkel concluded that these cavities may contain organisms in their normal condition during the life of the individual, but he does

not appear to have examined them bacteriologically so recently after death as did Törne.

Bacteriology of the Nasal and Postnasal Cavities in Acute and Chronic Catarrhal Conditions.—Allen[2] has examined the nasal mucus in forty cases of acute catarrh or "common" cold. The micrococcus catarrhalis was isolated in nineteen, the bacillus coryzæ segmentosus in eighteen, and the bacillus of Friedländer in fourteen. The bacillus influenzæ was only once found, but during the periods at which these examinations were conducted no influenzal epidemic had visited the district in which the individuals were living. Walter[5] has tabulated one hundred cases of acute, subacute, and chronic rhinitis. The micrococcus pyogenes var. albus, citreus, and aureus occurred in 56 per cent; the bacillus coryzæ segmentosus of Cautley in 35 per cent; and the micrococcus catarrhalis in 20 per cent. Friedländer's pneumobacillus and the pneumococcus of Fränkel were each regarded as causal organisms in 7 per cent. The B. influenzæ was never found though an influenzal rhinitis was prevalent in the district. With regard to our own observations,[1] thirteen specimens were examined from eight cases of acute nasal catarrh and one of chronic postnasal catarrh. The streptococcus pyogenes appeared to be the exciting cause in six, and the micrococcus pyogenes in two, of the acute cases. The pneumococcus was only once found. The bacillus of Hoffmann, the pseudodiphtheria bacillus, and the B. mesentericus were amongst the other organisms isolated.

Bacteriology of Chronic Nasopharyngeal Catarrh.—C. E. West[6] has given us the result of his recent investigations on the bacteriology of fifty cases of chronic postnasal catarrh. The cases were essentially of a chronic nature, and had been under observation for a considerable period of time, the majority of them having used an alkaline nasopharyngeal wash for weeks and even months. The sparsity in the number of bacterial types was a feature of the investigation. The pneumoccus occurred more frequently than any other organism, being found in no fewer than 70 per cent of all the cases, occurring in pure culture in 36 per cent. Streptococci were isolated in 24 per cent of the plates, being the predominant organism, however, in only two cases, and never in pure culture. In the majority of the cases the streptococcus salivarius was the type observed. The micrococcus pyogenes var. aureus

occurred in large numbers in 26 per cent, usually associated either with the pneumococcus or the streptococci. On several occasions a coccus morphologically indistinguishable from the meningococcus occurred in considerable numbers, in one instance being found in almost pure culture. The micrococcus catarrhalis was only isolated four times, i. e. in 8 per cent, while Friedländer's pneumobacillus occurred in 12 per cent, being the predominant organism in half of these.

Gourc,[7] Lartigan and Nicoll[8] have examined the secretion lying upon the surface of adenoid vegetations after their removal by operation. A variety of organisms were cultivated from it—the streptococcus pyogenes, the micrococcus pyogenes var. albus and aureus, the pneumococcus and various diplococci being obtained.

Bacteriology of Inflammatory Conditions of the Accessory Nasal Sinuses.—The following observations are from our own work[9] and from some hitherto unpublished cases, for which I am indebted to my friend, Dr. F. Esmond Reynolds. In twenty-two cases of acute and chronic frontoethmoidal sinus suppuration, which were operated upon, the pneumococcus was isolated in eight, or 36 per cent; the streptococcus pyogenes in nine, or 40 per cent; and varieties of the micrococcus pyogenes, albus, aureus and citreus flavus in ten, or 45 per cent. A bacillus closely resembling the influenzal bacillus occurred in one case. In forty-three cases of maxillary sinus inflammation the pneumococcus was present in thirteen, or 30 per cent; the streptococcus pyogenes in thirty-three, or 76 per cent; and varieties of the micrococcus pyogenes in thirty-four, or 79 per cent. The B. influenzæ was isolated in one, the tubercle bacillus in one, and the micrococcus catarrhalis in two.

It is obvious, therefore, from the brief foregoing account that a variety of microorganisms may be found in the healthy nasal and postnasal cavities of most individuals, and also in the same cavities and in the accessory nasal sinuses of many persons who are apparently in the enjoyment of excellent health but who are at the same time suffering from a chronic catarrhal or mucopurulent inflammation of the mucous membrane of their upper respiratory passages. The chief organisms which are found and which demand our attention are the pyogenic cocci, the pneumococcus, the micrococcus catarrhalis, the influenza bacillus, the meningococcus and the bacillus tuberculo-

sis. In the healthy upper air passages the bacteria are frequently in smaller numbers, in pure culture, of lower vigor, and of little or no virulence as compared with the organisms which are present in the inflammatory conditions. In the latter they grow with vigor in subcultures and are frequently pathogenic to animals. From a variety of causes, however, such as debility, chills, traumatism, diminishing the tissue resistance, or from the introduction of a fresh organism, bacteria previously quiescent or avirulent may become active and give rise to acute infections.

General Scheme of the Investigation.—In the following table I have indicated the various organismal infections which may have a primary focus in the nasal and nasopharyngeal cavities, and which will now be considered. It has already been shown that the organisms which produce them may be cultivated from these cavities in their healthy state or in simple catarrhal conditions. Although it is possible to demonstrate in some instances the lymphatic channels as pathways of infection, in other conditions again we cannot do more than assume that the lymphatic vessels may be the avenues along which the organisms are carried to neighboring structures.

A. From the nasal and nasopharyngeal cavities to the cerebrospinal meninges—

(a) Suppurative meningitis (pyogenic organisms).

(b) Influenzal meningitis (Pfeiffer's bacillus and allies).

(c) Pneumococcal meningitis (the pneumococcus).

(d) Epidemic cerebrospinal meningitis (the meningococcus).

(e) Acute poliomyelitis.

(f) Tuberculous meningitis (bacillus tuberculosis).

B. From the nasal and nasopharyngeal cavities to the cervical lymphatic glands—

Glandular enlargement and pulmonary disease (bacillus tuberculosis).

While the chief function of the various meningeal spaces with the fluid contained within them has been long regarded as serving as a protection to the brain against alterations in pressure, anatomists in more recent times have looked upon them as lymph spaces. Schwalbe first demonstrated by injection of the subdural space paths of communication between it and the olfactory mucous membrane, the perilymphatic space

of the labyrinth, and the perichoroidal space. Key and Retzius by injecting the same region were able to follow the injection into lymphatic vessels, which left the skull through the jugular foramen and carotid canal. They were also able to inject from the subdural space lymphatic vessels in the nasal mucous membrane. Flatau[10] was able to inject the lymphatic vessels of the nasopharynx from the subarachnoid space. Cuneo and André[11] have succeeded in young human subjects in injecting a lymphatic network in the pituitary membrane from the meningeal spaces, the vessels traversing the cribriform plate by small canals which are independent of the small olfactory nerve branches. This lymphatic network would appear to belong exclusively or almost exclusively to the olfactory region, and in this way resembles the similar extensions into the inner ear and the globe of the eye.

Our knowledge of the arrangement and distribution of the lymphatic apparatus of the accessory sinuses is still very meagre, and we are unable to give any descriptive account of them.

A. NASAL AND POSTNASAL CAVITIES TO THE CEREBROSPINAL MENINGES.

The number of cases of intracranial complication—meningitis, abscess, and sinus thrombosis—which have followed primary inflammation and suppuration in the nasal cavities and their accessory sinuses now form a fairly extensive series in literature. While the possibility of extension of the inflammation by way of lymphatics has been frequently considered, there can be no doubt that these structures probably play only a subordinate part as avenues of infection between the nasal cavities and the cranial contents. The difficulty in demonstrating anatomically a lymphatic connection between the upper air passages on the one hand and the cranial cavity on the other naturally increases our difficulty in proving the passage of microorganisms by such a route. Moreover, both on the operating table and in the postmortem room it has been so frequently shown that infection spreads in the majority of cases as a result of a carious or carionecrotic condition of the contiguous bony walls of the adjacent cavities or after complete destruction and perforation of the same. In other cases,

again, the venous channels which pass directly through the adjacent walls or indirectly from the nasal sinuses through the orbit by way of the ophthalmic veins to the cavernous sinus constitute another pathway of infection. When neither macroscopic nor microscopic evidence of any of these avenues can be found, it may then be legitimate to assume that the lymphatics, if such exist, have been responsible for the propagation of the infection to the brain and its coverings. We have endeavored in the following description to analyze the evidence in favor of the latter route of infection in meningitis.

(a) *Pyogenic or Suppurative Meningitis.*—Examination of the monographs of Dreyfuss and Gerber, who deal at great length with the intracranial complications of nasal and accessory sinus suppuration, shows how scanty are the references bearing upon lymphatic infection. The former quotes the cases of Quinlan and Wagner, in which death from meningitis followed the application of the cautery to the nasal mucous membrane. As no postmortem examination was made in either case, direct evidence as to the path of infection is wanting, but the lymphatic or venous channels may offer the possible explanation, as death followed rapidly upon the operation. Death from meningitis has followed removal of nasal polypi, and of the middle turbinated bone in patients suffering from ethmoidal suppuration, and more than one fatal result from a similar complication has occurred after submucous resection of the nasal septum in nasal cavities devoid of any suppurative focus. I have been unable to find any detailed postmortem report as to the mode of infection in these cases. Hayen reports a case of epistaxis in which a chemist plugged the nose with tampons soaked in perchlorid of iron. The patient died a few days later with symptoms of meningitis. At the postmortem the whole length of each olfactory sulcus had a brown discoloration and the nerve substance reacted to Prussian blue. It was evident that the perchlorid of iron had reached the brain along the nerve branches passing through the cribriform plate. In ten cases of ethmoidal cell suppuration with intracranial complication cited by Dreyfuss, perforation or disease of the cribriform plate was found in three, in one perforation of the lamina papyracea, in one the infection spread by way of the orbit, and in one no statement was made as to the pathologic condition present in the bone. In the remaining five there was no naked-

eye evidence of disease of the lamina cribrosa. Four of the latter were acute cases of sinus suppuration, in which death supervened so rapidly that destruction of the bone was not possible; in them death resulted from basal meningitis, which was well marked over the ethmoid plate. Unfortunately no microscopic examination was made of the ethmoid bone.

Twelve cases of fatal intracranial complication secondary to sphenoidal sinus suppuration are quoted by the same author. In only one case, namely that published by Ortmann, was a microscopic examination made of the mucous membrane and osseous wall of the sphenoidal cavity. In the mucosa, periosteum, osseous tissue, and dura mater numerous diplococci and pus cells were observed. The intracranial affection in this case was an extradural abscess in the sella turcica with thrombosis of both cavernous sinuses secondary to periostitis and osteitis of the sphenoidal sinus. There was no evidence microscopically of lymphatic invasion. The existence of cavernous sinus thrombosis indicated an extension of the infection through the small venous channels penetrating the bony wall of the sphenoidal sinus and opening into the cavernous blood space.

In Gerber's classical monograph, "Die Komplikationen der Stirnhöhlenentzündungen," published in 1909, 160 cases of intracranial complication secondary to frontal sinus inflammation have been collected and carefully analyzed. Of twenty-eight cases of extradural abscess, one reported by Gyselynck and Mayer was regarded as probably due to infection by way of lymphatic channels. The case was one of acute frontal sinus inflammation due to streptococcal infection. The sinus walls at the operation showed no defect. As the patient recovered, proof is wanting as to the exact manner of the infection. In fifty-one cases of purulent leptomeningitis and fifteen cases of thrombophlebitis none were ascribed to lymphatic infection. In only one of sixty-six cases of brain abscess was the infection regarded as propagated by the lymphatic vessels. The case which was published by Hoffmann was one of chronic bilateral frontal sinus suppuration complicated with abscesses of streptococcal origin in both frontal lobes. A perforation of the posterior osseous wall was found in the right frontal sinus, but Hoffmann regarded the lymphatics as the path of infection to the left frontal lobe from the left frontal sinus. Unfortunately no microscopic examination was made.

It is obvious, therefore, that the conclusive proof of intracranial infection by pyogenic organisms from the nose by way of lymphatic vessels requires more direct evidence than has yet been obtained. In addition to the cases already mentioned, others are recorded, e. g. those of Huguenin, Ogston, and Warner, in which to the naked eye no bone lesion was apparent, Ortmann's case, however, demonstrates the fact that even in such instances microscopic examination proves that the infection will spread through the bony walls by continuity of inflammation; therefore one is not justified in assuming that, because there is no macroscopic change in the bone, the infection must in consequence have spread by lymphatics. In all fatal cases of this kind a more minute histopathologic examination is very desirable.

(b) and (c) *Pneumococcal and Influenzal Meningitis.*—It will serve our purpose equally well and prevent needless repetition if pneumococcal and influenzal meningitis are considered together. Both Fränkel's pneumococcus and Pfeiffer's bacillus may be found together in the nasal secretion, and the latter has been found in a few cases of meningitis, sometimes alone and sometimes in association with pyogenic cocci. Pfühl[12] is of the opinion that in these cases the path of infection to the brain is directly through the roof of the nasal cavity. Although meningitis due to both of these organisms may result from a blood infection there is evidence of direct meningeal infection from the nasal, postnasal, and accessory nasal cavities. As proof of this statement it is not necessary to do more than cite a few illustrative cases. It is true that the same difficulty which was found in proving a lymphatic connection in pyogenic affections is again encountered here, and we are forced to assume rather than bring proof of the exact pathway of infection. Weichselbaum has drawn attention to the possibility of the inflammation spreading from the meninges to the nasal cavities. In the cases of primary acute meningoencephalitis investigated by Weichselbaum[13] from which the pneumococcus was cultivated, the same organism was found in the nasal accessory sinuses and middle ear cleft in four instances. The examination of the relative degree of the inflammation existing in the meninges on the one hand and the accessory nasal cavities on the other forced him to conclude that the infection had spread from the nose and pharynx by way of the sinuses and middle

ear cleft to the meninges. The same author[14] has recorded a case of acute leptomeningitis and frontal lobe abscess due to the pneumococcus in a young man suffering from influenza, in whom the right maxillary and frontal sinuses were affected.

It is regrettable that a complete examination was not made in Zörkendörfer's[15] case. The patient was a woman, aged 30, who was brought to the hospital in an unconscious condition. Two days previously she had suffered from a rigor. Her temperature was elevated. She became comatose, and developed rigidity of the neck and paralysis of the right facial nerve. Two days after admission she died. Postmortem examination revealed redness and detachment of the mucous membrane of the nasal and ethmoidal cavities, and the mucosa of the sphenoidal sinuses was covered with thick pus. The other organs showed no evidence of disease. There was a well-marked leptomeningitis both of the convexity and of the base of the brain. Fränkel's pneumococcus was found in the meninges and in the pus in the sphenoidal sinuses. Microscopic sections demonstrated the piaarachnoid infiltrated with round cells. The meningeal vessels were filled with blood, the leucocytes being increased in number, in some places half of the lumen being filled with dense masses of the same. Zörkendörfer concluded from this examination that the pneumococcal immigration did not take place by way of the blood-vessels, because the large leucocyte masses within the blood-vessels were free from bacteria, whereas the meningeal exudate was infiltrated with cocci, He was therefore inclined to the view that the passage of the organisms into the cranial cavity had taken place either by the lymph channels or by the inflammation spreading by continuity of tissue through the walls of the sphenoidal sinus to the membranes. It is unfortunate that no histologic examination of the bone was made.

Grober[16] has recently discussed the path of infection in pneumococcal meningitis and considers that it may be by the lymphatic channels as well as by the blood vessels. He regards the lymphatic tissue of the nasopharynx and pharynx as a portal of infection in pneumococcal meningitis, the organisms normally present in the nose and mouth finding ready access under pathologic conditions. As regards the pathway from the portal of entrance to the meninges, he says further investigation has yet to be made. Two cases bearing upon direct

infection from the upper air passages are recorded in Grober's paper. In the first case, as the result of a fall upon the occiput, a fracture of the base of the skull passed through the root of the nose and the ethmoidal bone. The patient died without any evidence of pneumonia. He discusses the question as to whether the organisms gained entrance through the injury to the scalp or reached the meninges from the nose, and he decided upon the latter route. The second case was that of a child, aged 8, who developed all the signs of meningitis; spinal puncture revealed the presence of pneumococci in the cerebrospinal fluid. The posterior wall of the pharynx, uvula and tonsils was markedly inflamed from the very outset of the symptoms. All the other organs were healthy, and there was no clinical evidence of pneumonia. The child recovered under treatment with Römer's serum.

Meningitis due to Pfeiffer's influenza bacillus, although not common, is now well recognized. Pfühl[12] was the first to demonstrate the presence of the bacillus in the meningeal exudate. Dubois has collected eleven cases of meningitis in which the bacillus was present, and many other cases are recorded. The question of the portal of entry of the bacillus influenzæ into the central nervous system has been much discussed. We have already referred to the presence of the organism in the nasal and accessory cavities, and the fact that the common type of influenza is the respiratory one, often characterized by an acute rhinitis, would suggest the nose and nasopharynx as a probable portal of entry. E. Fränkel is an advocate of the hypothesis that the bacilli are conveyed by the lymphatics of the nasal mucosa through the cribriform plate directly into the cranium. While the theory is plausible, postmortem evidence of this pathway of infection is not satisfactory. Ghon[17] has reported the case of a man dying of influenzal meningitis. The mucous membrane of the nasopharynx was red and swollen and covered with a mucopurulent discharge; in the right frontal sinus there was a quantity of yellow pus, while the mucous membrane of the right antrum was swollen and the cavity contained exudation. There was a leptomeningitis of the right cerebral hemisphere. The mucosa of the larynx and trachea was also inflamed and a lobular pneumonia existed. The meningeal exudate, as well as that in the frontal and maxillary sinuses and in the nasopharynx, contained a

similar organism, colonies of which were identical in appearance to that of the bacillus influenzæ.

Pencker, Mya, Cagnetto, Cohen, Hecht, Langer, James Ritchie, and others have reported cases of meningitis associated with an influenza-like bacillus, occurring at a time when influenza did not exist in an epidemic form. The subject is thoroughly discussed by Ritchie[18] and is referred to here on account of the possibility of the meningeal infection being secondary to a nasal and nasopharyngeal inflammation. The cases are apparently sporadic, and young children are affected. The condition is extremely fatal. Although in some cases the meningeal affection has been part of a general pyemic process, a further point of note is the frequent association of the meningitis with middle ear suppuration or with suppuration of the frontal or maxillary sinuses. While it must be borne in mind, in the light of certain of the cases showing evidence of a general pyemia, that the pus in these cavities and in the meninges may arise from some common source of infection elsewhere in the body, a provisional opinion may be expressed that in many of them, perhaps in the majority, the meningitis results from the spread of an infective condition from the nasopharynx.

(d) and (e) *Epidemic Cerebrospinal Meningitis and Acute Poliomyelitis.*—These two diseases of the central nervous system possess certain features in common which justify us in briefly studying them together. They occur both in epidemic form and as sporadic cases, and they must be regarded in the light of acute infectious diseases. They attack by preference infants and young children. What is of chief importance, however, in connection with our subject is the fact that the virus in both conditions is found in the nasopharynx, and appears to have a predilection for invasion of the nasopharyngeal mucous membrane, and from there to pass, presumably by the lymphatic system, to the central nerve apparatus. It should be pointed out that Flexner has been able to demonstrate in monkeys the passage of the meningococcus within the leucocytes from the meninges into the nasopharynx, so that in cerebrospinal meningitis the nasopharyngeal mucous membrane may serve both as an exit and as an entrance for the organism. In man it is naturally difficult to establish the former. Although no organism has yet been identified in the production of acute

poliomyelitis, Flexner has demonstrated experimentally that the disease can be conveyed to monkeys by inoculating an emulsion of the virus from fatal cases in man; further, that the disease can be transmitted through a series of monkeys. Up to the present time investigators have failed to demonstrate the virus as an entity visible through the microscope.

Cerebrospinal Meningitis.—We have already referred to the presence of the meningococcus in the nasopharynx in West's series of investigations in cases of chronic nasopharyngeal catarrh, and many observations might be quoted as to its occurrence in the nasopharynx, not only in those who have been victims of the disease, but also in those who have been in contact with patients, and who must be regarded as carriers. Westenhöffer's researches and those of Lingelsheim have made it more probable that the nasal cavities proper and the accessory sinuses do not serve as the portal of infection in the same way as does the nasopharynx. The former[19] in thirty postmortem examinations upon fatal cases of the disease, found the ethmoidal cell labyrinths almost always free from inflammatory disease. Bacteriologic investigation confirms this, because in the secretion from the nasal vestibule and anterior part of the cavities the meningococcus was seldom isolated, whereas it was very frequently found in the secretion from the posterior part of the nasal cavities and the nasopharynx. Lingelsheim's observations are of a similar nature.

Edmund Meyer[20] examined a number of children affected with the disease during the epidemic in Upper Silesia in 1905. The nasopharynx was examined during the early days of the affection, and in spite of the difficulties attending posterior rhinoscopic examination well marked inflammatory changes were observed in the nasopharynx. Some of his observations were confirmed by postmortem examination. In the other organs examined after death no changes or only very unimportant ones were recognized. If the nasopharynx could be observed before the onset of the meningeal symptoms, more valuable proof of this portal of infection would be obtained. In the only case in which Meyer observed the outbreak of the disease, nasopharyngeal symptoms preceded the others. Busse[21] has also given attention to this point and has confirmed the observations already made, and has satisfied himself that in the rapidly fatal cases redness and swelling of the mucosa with

excess of secretion in the nasopharynx existed, while in the cases following a slower course the changes in the mucous membrane were more advanced.

If these facts be accepted, the question naturally arises as to the pathway of the organisms to the meninges. The evidence is somewhat conflicting as to the part played by the sphenoidal sinus. This cavity does not commence to develop until the third year of life, therefore in many young children, who form so large a proportion of these cases, this route cannot be considered. Meyer examined clinically one hundred cases of the disease and was of the opinion that the sphenoidal sinuses were not affected. Westenhöffer made a routine examination of the accessory sinuses postmortem, and in the acute stage frequently found swelling of the mucous membrane with mucoid exudation and sometimes pus in the cavity. Meyer made serial sections of the nasopharyngeal tonsil, but was unable to detect the organism in the deeper parts. He only observed it upon the surface. The frequency of inflammation in the middle ear cleft in cases of cerebrospinal meningitis raises the question as to whether it may not take part in carrying the infection from the nasopharynx to the meninges. Hirsch has pointed out that in the early stages of the disease patients may complain of ear symptoms. The question arises, therefore, as to whether the labyrinthine disease so frequently met with in this affection may not result from infection spreading from the middle ear rather than as a labyrinthitis secondary to the meningeal inflammation, as has so long been held to be the case. In this as in the other forms of meningitis already discussed the part played by lymphatic vessels in the propagation of infection is still open to further investigation.

Acute Poliomyelitis. Flexner[22] believes that the nasal mucous membrane serves not only as the portal of infection, but also as the path of elimination of the virus, and he further considers that all the theoretical conditions required to establish the nasomeningeal route as the direct one for infection have been supplied by experiment. In the report of the Collective Investigation Committee of the New York Epidemic of 1907, Wickham has called attention to the lymphatics as the route of infection. Flexner and Lewis have shown that the virus will travel up the sheath of the sciatic nerve. The question naturally arises, therefore, as to whether the infection may

spread from the upper respiratory passages to the meningeal spaces. Harbitz and Schoel in the one case which they were able to examine microscopically could not find any evidence of infection passing along the olfactory nerves, and the nasal and accessory cavities were normal. Levaditi[23] was unable to inoculate the nasal mucous membrane with the virus with any positive result. The more recent observations of Sohier Bryant[24] tend to show that nasopharyngeal catarrh is very prevalent in communities in which poliomyelitis exists, while the experiments of Osgood and Lercas[25] demonstrated that it was possible to transmit from monkey to monkey a typical poliomyelitis from the filtrate of the nasopharyngeal mucosa of two monkeys dying without any other obvious infection six weeks and five and a half months respectively after the acute stage of the disease. In all probability further light will be thrown upon the transmission of this acute infectious disease in the immediate future.

(f) *Tuberculous Meningitis.*—Considerable discussion has from time to time arisen as to the part played by the nasal and postnasal cavities as pathways of infection in tuberculous meningitis. The existence of tubercle bacilli in the healthy nose and their presence in adenoid vegetations, the occurrence of primary nasal tuberculosis as a more common affection than was at one time realized, and the close proximity of the cavities to each other would naturally lead us to assume that infection of the meninges by way of the nasal passages might not infrequently occur. Weigert, indeed, believed that this was the usual mode of infection.

Experimental work upon the production of meningitis by inoculating the nasal mucosa with tubercle bacilli has been carried out by Magunna and Knowles Renshaw and others. The former investigator[26] used an emulsion of a culture of bacilli, in some cases injecting the mucosa with a few drops by means of a Pravaz syringe as far back in the nasal cavity as possible, in other cases merely laying a few drops of the emulsion upon the healthy surface of the olfactory mucous membrane. Of the twenty guinea pigs thus inoculated six died of meningitis. Of the six cases in which inflammatory changes were found in the cerebral membranes, three had been inoculated beneath the mucous membrane, while in the remaining three the surface had merely been smeared with the emulsion.

The animals lived from sixteen days to one month after the experiment. In all the animals the nasal mucous membrane was congested, and in four granulations were also present. In the first experiment these granulations are described as miliary tubercles; when examined microscopically no bacilli were found in them, and they were not used for further inoculation experiments. In all the cases the meninges were congested, while in three granulations were also found. The changes were most marked at the anterior part of the brain, and in three of them special reference is made to the intensity of the inflammation in the region of the cribriform plate. All the animals lost weight.

Knowles Renshaw[27] infected the nasal mucous membrane of guinea pigs with tubercular sputum, the part of the nasal cavity selected being the superior fossa. In three it was introduced in the fluid state through a small silver canula, while in the fourth a piece of dried sputum was introduced by means of a piston through the canula. In order to avoid any bruising of the mucous membrane, chloroform was administered in each case. Three animals were killed on the twenty-seventh, fifty-seventh, and fifty-fourth days respectively, while the fourth animal died on the ninety-eighth day. In none of these experiments was meningitis produced. Although Magunna's observations supply experimental evidence of the direct spread of inflammation from the nasal cavity to the meninges, no proof is forthcoming as to the path of infection, as apparently the tissues were not subjected to any histologic examination. For the same reason it is not definitely proved in these experiments that the resulting meningeal infection was of a tuberculous nature. The anatomic researches of André upon the naso-meningeal communications show that the lymphatic network occupies the olfactory portion of the nasal cavity, and is distributed upon the upper fourth or third of the nasal septum and external wall of the cavity. The extent of this area will doubtless vary, therefore, in different animals. At the same time it might exert an important influence upon the seat of inoculation in experimental work. Renshaw placed his tuberculous material in the upper part of the cavity without injuring the mucous membrane, and we may presume from this description that the olfactory region was reached. No meningitis, however, developed. Magunna, in three experiments in which

the mucosa was injured, passed the needle of his syringe to the posterior part of the nasal cavity; also in three experiments in which no injury was inflicted the olfactory mucosa was smeared. In all his experiments, however, pathologic changes in the meninges of the anterior cerebral fosa were observed. In two experiments carried out for me by Dr. J. S. Fraser, in which the anterior part of the nasal fossa was inoculated, no meningeal inflammation was set up.

Demme's case[28] has often been quoted as furnishing evidence of tuberculous meningitis secondary to a focus in the nasal cavity. The patient was a child, aged 8 months, without any antecedent history of tuberculosis or syphilis. When 4 months old the child had been put out to nurse in a family, the father of which suffered from acute pulmonary tuberculosis. When 6 months of age a discharge from the nose was observed and examination revealed the presence of small ulcerated granulations. In the secretion from the nose a large number of tubercle bacilli were found. Without any apparent cause the child developed symptoms of acute meningitis, and died four days afterwards. At the autopsy tuberculous meningitis at the base of the brain was found, many miliary tubercles being scattered along the vessels, especially about the anterior and inferior cerebral veins. No tubercle was observed in the substance of the brain or the cerebellum, no caseous foci existed in the lungs, bronchial glands or other organs, which were quite healthy. The mesenteric and axillary glands were slightly swollen. No examination of the ethmoidal region was made, but the nasal mucous membrane was examined microscopically by Langhans, who reported upon the presence of tubercle bacilli associated with giant cell systems. Huey[29] has reported a case of extensive tuberculous disease of the left nasal cavity in a patient who submitted to an operation for the removal of some of the tissue. Three weeks later headache, vertigo, fever with delirium, strabismus and ptosis developed, which was followed in eight days by coma and death. No postmortem was obtained. Clinically, no lesion could be demonstrated in the chest. Huey concluded that the meninges had become directly infected from the nasal cavity.

Summary.—It is evident from the foregoing account that the part which has been assigned to lymphatic vessels in carrying infection from the upper air passages to the cerebrospinal

cavities is largely speculative, and that definite pathologic proof of the same is still wanting. It appears from the data collected that some writers have given to lymphatic channels between the nasal and accessory nasal cavities on the one hand, and the central nervous system on the other, a position which is hardly justified by anatomic facts as at present known. Even granting that future investigation may demonstrate a well-developed network of intercommunication, the lymph-flow through it will take a direction from the brain towards the nasal cavities and cervical lymphatic glands. Consequently the danger of meningeal infection by such an avenue from organisms in the nasal cavities, will be diminished. The experiments of Flexner already referred to, that the meningococcus will pass from the meninges into the nasopharynx and that the nasopharyngeal mucous membrane thus serves as a gate of exit for the organism, furnish experimental evidence upon this point. In the great majority of cases of chronic nasal suppuration in which an intracranial complication has developed, evidence has been found demonstrating the spread of the infection through disease of the contiguous bony wall. In cases of meningeal infection, however, in which no chronic nasal disease has existed, and in which destruction of the bony walls has therefore not been possible, some other path of infection must be looked for. This may be, and in some cases has been, definitely shown to be by venous channels. It will require further investigation, first along anatomic lines, and secondly by careful microscopic examination, both in experimentally induced meningitis and in fatal cases in which nasal and accessory sinus disease has furnished the primary focus of infection, to prove that such infection may take place by lymphatic channels.

B. TUBERCULOUS INFECTION OF THE CERVICAL LYMPHATIC GLANDS AND LUNGS FROM THE NASAL AND NASO-PHARYNGEAL MUCOUS MEMBRANE.

It is intended in this part of the subject to illustrate the relation of the lymphatic system of the nasal and postnasal cavities to other parts of the body by means of the tubercle bacillus. We are thus at once brought into touch with the question of the main avenues of infection of tuberculosis, namely, by inhalation, ingestion, and lymphatic invasion. The

problem which interests us is not so much one of aerogenic or inhalation as opposed to ingestion or deglutition tuberculosis, but rather of aerogenic versus lymphatic invasion. In other words, to what extent are the lungs primarily infected by inhalation of material containing tuberculous virus, or in what proportion of cases are they infected through the cervical lymphatic system from inoculation of the nasal and nasopharyngeal mucous membrane. The lines along which research has been conducted have been anatomic, experimental, and clinical, and it is our intention to discuss the subject in the same way.

Anatomic Considerations.—The regional lymphatics of the nose and nasopharynx so ably worked out in recent years by Most[30] may be briefly summarized here in order to make more clear the clinical points which follow. With the exception of a small area of mucous membrane in the anterior part of the nasal cavity from which the lymph channels pass forwards on to the face, the main lymphatic drainage passes backwards through the choanæ. The lymphatic vessels, along with those from the nasopharynx and from the palatal arch and faucial tonsil, terminate in the superior deep cervical glands, some of which lie along the internal jugular vein, while others are placed more laterally beneath the sternomastoid muscle and upon the anterior scaleni muscles. The lymph flow from both these groups passes into the inferior deep cervical glands, which, like the superior, lie in two groups, one placed more superiorly and externally in the supraclavicular triangle, the other more mesially placed in relation to the internal jugular vein and common carotid artery extending behind the inner end of the clavicle. The efferent vessels from the inferior deep cervical glands form a common lymphatic jugular trunk, which opens on the right side of the neck into the veins at the junction of the internal jugular and subclavian veins, and on the left side into the terminal bend of the thoracic duct.

It is necessary for our purpose to note further the lymph flow in the mediastinal glands. The tracheal and bronchial glands receive their afferent vessels from the mucous membrane of the trachea, the bronchial tubes, and pulmonary alveoli. The efferent vessels from the tracheobronchial glands, along with the majority of the parietal and the whole of the visceral lymphatics of the thorax, assist in forming a broncho-

mediastinal trunk, which terminates like the jugular trunk in the large veins at the root of the neck upon the right side and in the thoracic duct on the left side.

It is evident, therefore, anatomically, that the lymphatic drainage of the nose and nasopharynx passes through the deep cervical glands into the venous circulation at the root of the neck, and has no direct communication by efferent lymph vessels with the tracheobronchial glands. Similarly, the lymph from the tracheobronchial glands passes into the venous circulation, and has no direct communication with the inferior deep cervical glands. The supraclavicular glands, however, receive certain afferent vessels from the arm, the integuments of the pectoral region, and also from the mamma.

Most has drawn attention to the difficulty in injecting from the pharynx the inferior deep cervical glands lying in the supraclavicular triangle. Lasagna[81] has recently confirmed these observations. He injected with colored material the superior deep cervical lymphatics, and in forty-one out of forty-two cadavera the material passed into the large veins quite independently both of the group of glands in the supraclavicular triangle and of the tracheobronchial glands. While anatomic investigation has apparently failed to establish a direct communication between the mediastinal glands and the deep cervical glands in the supraclavicular triangle, there would appear to be clinical evidence to the contrary. This would appear to be a suitable place to refer to clinical observations in this connection. When the supraclavicular glands are found enlarged without any evidence of the enlargement of the superior deep glands in the cervical chain, the attention of the clinician is naturally directed to the thorax in seeking a cause for the enlargement of the former. The following two cases which have recently come under my observation bear upon this point: A. S., aged 50, had suffered from hoarseness for three months; he was becoming thinner, and had lost one and one-half stone in six months. He first noticed enlarged glands above his right clavicle three months before he came under observation. He had had no respiratory trouble and no difficulty in swallowing. The left vocal cord was fixed in the cadaveric position. The glands above the right clavicle were hard and gave the impression of being malignant. The superior deep cervical glands were not en-

larged. Examination of the chest revealed an area of dullness to the left of the sternum; an X-ray picture showed a distinct abnormal mediastinal shadow. A diagnosis of malignant disease of the mediastinal glands was made, with involvement of the left recurrent laryngeal nerve.

The second case was that of a woman who had had her right breast removed for malignant disease. She had suffered from hoarseness for two and a half months before she came under observation, and more recently she had noticed enlargement of the glands above her right clavicle. Her left vocal cord was fixed in the cadaveric position. In this case we had no post-mortem information regarding the condition of the intrathoracic organs. While it might be argued that the enlargement of the right supraclavicular glands was due to a secondary growth spreading to them by way of superficial lymphatic vessels from the pectoral region, the associated paralysis of the left vocal cord indicated involvement of the left recurrent laryngeal nerve, presumably from enlarged glands within the thorax. Both cases, therefore, appear to us to furnish clinical evidence of communicating lymphatic vessels between mediastinal and cervical glands. It is possible, therefore, that the supraclavicular glands may occupy an intermediate position, receiving afferent vessels both from above and from below.

While the above facts represent the anatomic arrangement of the lymphatic drainage of the neck and the relation of the mediastinal and cervical lymph systems, we must now consider the evidence furnished by experimental and clinical data. Three propositions have been put forward as to the manner in which tubercle bacilli may pass from the cervical lymphatics to the lungs and mediastinal glands. We have, in the first place, that which is based upon the anatomic facts above described, namely, by way of the large veins to the right side of the heart and thence by the pulmonary artery to the lungs and tracheobronchial glands. Secondly, the thesis held by Klebs, Grober, Philip, Bacon-Wood, and others that the lowest of the deep cervical glands infect the apex of the lung by direct extension through the tissues. Thirdly, the view by Aufrecht[32] and others that an anatomic connection exists between the cervical and mediastinal glands, so that infection will pass direct from the former to the latter and thence to the lungs through adhesion of the glands to the pulmonary artery and

the entrance of the bacilli into the blood stream through its wall.

Experimental Considerations.—Sufficient experimental proof has been brought forward by a number of observers to prove that tubercle bacilli inoculated upon the mucous membrane of the upper air passages will infect the cervical glands; it is unnecessary to dwell further on this well recognized fact. Experimental proof, however, as to the mode of extension of the infection from these glands to the bronchial glands or to the lungs is more difficult to obtain, because when the nasal or nasopharyngeal mucous membrane is inoculated with tuberculous virus the possibility of pulmonary infection by inhalation cannot be lost sight of. Consequently the difficulty in deciding as to the part played by the cervical glands in propagating the infection to the lungs is obvious. The assertion that the real pathway can be ascertained by noting the older and the more recent tuberculous changes may be true in some cases, but it cannot be always accepted as providing reliable data from which the correct deduction may be drawn. Thus if the cervical glands show evidence of advanced tubercular disease, while the changes in the lung and bronchial glands are of a more recent date, it would be natural to assume that the infection had spread to the last named structures from the pharyngeal mucous membrane by way of the cervical glands. We cannot, however, exclude the possibility of the pulmonary disease arising by inhalation as an infection quite independent of and possibly more recently than that of the cervical glands. That tuberculous infection may take place by a twofold portal of entrance is illustrated by the inhalation experiments of Louis Cobbett.[38] By spraying an emulsion of tubercle bacilli in front of guinea pigs he found that when the animals were killed after a few minutes or hours the lungs were found to be infected, while the cervical glands showed no evidence of tubercle. On the other hand, in seventeen animals similarly dealt with, which were allowed to live from five to thirty-six days, sixteen showed pulmonary and bronchial gland tubercle, the gland infection being secondary to that of the lungs. In thirteen of the animals the deep cervical glands were also affected, their infection taking place early in the course of the experiment and concurrently with the lung infection, but the disease had progressed more slowly in them, the bacilli being few in number.

Other difficulties which present themselves when we attempt to follow the path of infection taken by the tubercle bacillus are found in the fact that the bacilli may leave no sign to indicate their point of entry, and that they may be present in the glands without producing any histologic evidence of their existence there. Thus Bartel and Spieler[24] have demonstrated, by inoculating animals with the lymphoid tissue from the pharynx, that in 11 per cent. of cases tuberculosis could be produced, and yet in none of the specimens of tonsil used was there any microscopic evidence of tuberculous tissue. Similarly, as the result of inoculating cervical gland tissue into animals, tuberculosis was produced in 58 per cent of the experiments, while microscopic evidence of tubercle was only found in 45 per cent of the glands; the tubercle bacilli were scanty or could not be found. Numerous other investigators have carried out similar experiments. Further, it must be remembered that once the lungs have become the seat of tuberculous disease, the cervical glands may be secondarily infected by the tubercle laden sputum most commonly passing through the faucial tonsils, but possibly also in some cases through the nasopharyngeal lymphoid tissue. Again, nasopharyngeal secretions containing bacilli may be swallowed and the organisms taken up by the mesenteric lymph glands and thence conveyed to other groups of glands. For these reasons, therefore, it may be difficult to follow the exact pathway of infection.

The experiments of Knowles Renshaw[27] throw some light upon the path of infection from the cervical glands to the thorax. He inoculated the surface of the nasal mucous membrane of seven guinea pigs with sputum containing tubercle bacilli. In one group of animals, four in number, the entrance and the anterior and lower part of the nasal cavity were inoculated; in the second group of three animals the application was made to the superior and more posterior part of the cavity. In the former the animals were killed from twenty-eight to fifty-six days after inoculation. In all of them slight inflammatory changes were observed in the nasal mucosa. The respiratory passages were normal; the lungs and peribronchial glands were unaffected; the abdominal organs were healthy. Evidence of tuberculous disease was only found in the cervical glands.

In the second group, in which the more posterior part of the nasal cavity was inoculated, the three animals lived for fifty-four, fifty-seven, and ninety-eight days respectively. Caseous material, ulceration of the mucous membrane and tubercle bacilli were found in the nasal chamber in all of them. The pharynx, larynx, and trachea were normal. The lungs showed extensive tuberculous disease, and the bronchial glands were also tuberculous. The cervical glands were similarly affected. The liver and spleen were also tuberculous.

It is obvious from these experiments that a local nasal tuberculosis may be produced by merely painting the mucous membrane with a suitable virus and that the efferent lymphatic vessels will carry the infection to the cervical glands. They further demonstrate the fact that the bronchial glands only became infected in those cases in which the lungs were also involved. These experimental data support the anatomic facts already detailed. The question as to the mode of infection of the lungs requires consideration. Two avenues of infection are possible, either an inhalation tuberculosis taking place pari passu with the cervical gland infection or infection through the cervical lymphatics into the large veins and right side of the heart, thence to the lungs. In favor of the latter route is the character of the lung infection. In two the lungs were studded with tuberculous deposit, in the third there was "extensive disease of the lungs," or to quote Renshaw's own words more fully, "the infection was never confined to one or two foci, but consisted of numerous tubercles scattered fairly evenly through all the lobes of the lungs." This description suggests the miliary nature of the pulmonary tubercle such as would arise from infection carried through the pulmonary artery. Again, the presence of tubercle in the liver and spleen furnishes additional evidence of the bacilli having passed through the blood circulatory system. Knowles Renshaw considered that his experiments proved that the various organs had been infected through the lymphatic circulation in the following order:—superficial and deep cervical glands, peribronchial and retrohepatic glands, lungs, liver and spleen. The experiments seem to us, however, to furnish proof of infection by the first of the three avenues which we have described, and consequently support the more direct anatomic route.

Vallée[85] introduced several milligrams of living tubercle into the nasopharynx in twelve cattle. In no case was pulmonary tuberculosis induced. In four of the animals, however, tubercle was demonstrated in the retropharyngeal glands, in the cervical and in the tracheal glands. These experiments furnish proof of the direct passage of infection from the nasopharynx through the lymph paths to the cervical glands, but in the light of our anatomic knowledge they cannot be regarded as demonstrating the further passage of the organisms from the cervical to the tracheal glands. Even though the lungs remained unaffected, some of the bacilli may have found their way by inhalation to the trachea, where an infection of the mucous membrane would give rise to disease of the tracheal glands through their afferent lymphatics.

Clinical and Pathologic Considerations. — The tubercle bacillus has been identified by various observers in the healthy nasal cavities. Strauss[86] was able to demonstrate its presence in persons connected with hospital life by inoculating and infecting guinea pigs with the nasal mucus. Moeller[87] found the bacilli on three occasions in his own nose and also in the nasal secretion of the attendants and ward maids of a sanatorium. Noble Jones[88] was able to produce tuberculous disease in three animals out of thirty-one after inoculating them with the nasal secretion from healthy individuals. Von Besser examined eighty-one healthy persons without finding any tubercle bacilli in their nasal secretion. That tubercle bacilli may lodge in the nasal cavities and produce a localized tuberculous affection of the mucous membrane is shown by the number of cases of nasal tuberculosis met with. During the last four years fifty-six cases of this condition have come under observation in the Ear and Throat Department of the Edinburgh Royal Infirmary.

It is rare to find the tubercle bacillus in inflammatory conditions of the accessory sinuses. It was only occasionally isolated in our own observations.[1] Keckwick, Gaudier, and Coakley have each recorded a case of primary tuberculous infection of the maxillary sinus.

In the nasopharynx, however, mainly in connection with the nasopharyngeal tonsil, many investigators have demonstrated the presence of tubercle bacilli or changes in the lymphoid tissue dependent upon the bacillus. This evidence has

been obtained partly by inoculation experiments and partly by histologic examination of the tissue removed by operation. I have only tabulated the results obtained in individuals in whom there was no reason to believe that tubercle existed elsewhere in the body, consequently all are cases of primary infection of the nasopharyngeal tonsil. The percentage of cases in which evidence of tubercle was found varied from 2, 3, 4 and 5 per cent to 12, 14, 16 and 20 per cent, giving an average of 6 per cent of adenoids harboring tubercle.

Author.	Tubercle	Cases Examined	Per Cent
Pilliet	3	40	7
Lermoyez	1	75	1
Dieulafoy	7	35	20
Gottstein	4	33	12
Pluder and Fischer	5	32	14
Piffl	3	100	3
Lewin	10	200	5
McBride and Logan Turner	3	100	3
Moure	1	40	2
Broca	0	100	..
Brindel	8	64	12
Luzzati	0	50	..
Scheibner	0	14	..
Wex	7	210	3
Hynitsch	7	180	3
Baup	1	48	2
Wright	0	51	..
Blumer	4	85	4
Lartigan and Nicoll	12	75	16
MacFayden and MacConkey	0	44	..
Ivens	1	35	2

Dieulafoy, whose percentage of twenty was obtained by inoculation experiments, has been criticised on the ground that the tubercle bacilli might have been in the secretion upon the surface of the tissue injected, while the adenoid mass may have been destitute of any evidence of tubercle. This possibility, however, does not affect our thesis, as we are concerned only with the presence of tubercle in the nasopharyngeal space. Lartigan and Nicoll's results, twelve positive findings in seventy-five specimens, or 16 per cent, were also obtained by inoculation. In eight of these tubercle bacilli and histologic evidence of tubercle were also found in the hardened tissues, while the remaining four contained tubercle bacilli without any histologic changes. The negative results of MacFadyen and MacConkey were also obtained by inoculation.

Having thus demonstrated the presence of tubercle in the lymphatic tissue of the nasopharynx, two illustrations of its extension to the neighboring lymphatic glands may be cited. These cases were reported some years ago.[39] A boy, aged 14, with a good family history, healthy looking and well nourished, and with no pulmonary disease, presented a mass of enlarged lymphatic glands involving the left superior deep cervical chain; the glands were matted together and formed a swelling about the size of a hen's egg. A large mass of adenoid hypertrophy occupied the nasopharynx. The adenoids and the hypertrophied cervical glands were removed. Evidence of tubercle was found in both situations. In the lymphatic tissue of the nasopharynx, tubercular giant cells, endothelioid cells and areas of degeneration were found but no tubercle bacilli could be detected. The largest of the cervical glands showed extensive caseation, while the smaller ones presented numerous small yellow caseous points. Microscopically numerous giant cell systems were observed in the glands. Nine months after the operation the boy was in the best of health and there was no trace of any glandular enlargement in the neck. The second case, a very similar one, was that of a girl, aged 11, with well marked adenoids and several enlarged glands in the deep cervical chain on both sides of the neck. A history of suppuration in connection with one of the glands on the left side was obtained and a scar bore evidence of the same. In the lymphoid tissue from the nasopharynx histologic appearances similar to those described in the first case were observed.

While these two cases illustrate tuberculous infection of the superior deep cervical glands, the following case is quoted in order to show that the infection may extend down the glandular chain and involve the supraclavicular glands. In this case, a young woman, aged 20, the primary infection took place through the faucial tonsil, which was an enlarged submerged gland, the nose and nasopharynx presenting a normal healthy appearance. On the left side of the neck three slightly enlarged glands could be palpated in the superior deep chain. Along the posterior edge of the sternomastoid muscle a chain of enlarged glands was visible, one gland in the middle of the chain being of some size. From the supraclavicular region a mass of caseous glands had been recently removed by the surgeon, who contemplated removal of those situated higher up

after the tonsil had been enucleated. No evidence of pulmonary disease could be detected. Microscopic examination of the left tonsil furnished histologic evidence of tuberculous infection in the form of a few scattered giant cell areas.

Up to this point, therefore, no difficulty has been met with either experimentally or clinically in establishing the presence of tubercle bacilli in the nasal cavities and a direct continuity of infection from the mucous membrane through the cervical chain of glands. The difficulty in establishing the further route of infection experimentally on account of the possibility of inhalation or even ingestion of the bacilli has already been pointed out. Clinical evidence as to the mode of extension from the neck to the lungs and mediastinal glands presents greater difficulties, and even postmortem findings are not conclusive.

In connection with the lymph gland pathway in the pathogenesis of pulmonary tubercle, Beitzke[40] has made some interesting observations, based on postmortem examinations. He first points out that in children a descending tuberculosis of the cervical lymphatic glands is not uncommon. In thirty-five cases of pulmonary and bronchial gland tubercle the cervical glands were found tuberculous in twenty-two and free from tubercle in thirteen. In seventeen out of twenty-four cases of descending cervical gland tubercle there was at the same time pulmonary and bronchial gland tuberculosis, the disease in the latter organs being much farther advanced than in the cervical glands. In only four cases in the series it was possible that the lung affection was secondary to the cervical glandular disease. Beitzke, as a result of his postmortem researches, came to the following conclusions: As the pulmonary and bronchial gland affection is usually of longer standing and has made more progress than that in the cervical glands, the former have been infected by inhalation of the virus, while the latter have become infected either secondarily by inoculation with tuberculous sputum through the tonsils or independent of the lung disease but coexistent with it and from the same source. Further, that in the absence of any direct lymphatic connection between the cervical and bronchial glands, tuberculous infection of the lungs by way of the cervical glands can only take place through the large veins and the right side of the heart.

Albrecht, from a study of one thousand and sixty tuberculous children, has formulated the view that the primary site of infection is most often in the lung from inhalation. If there is also tuberculosis of the cervical lymphtic glands, it is secondary to the pulmonary affection, and it is either of an ascending nature, from the peribronchial glands upwards, or descending, from secondary infection of the pharynx through the sputum.

In looking at this subject, from its clinical aspect, we are further led to study the second proposition, namely, the infection of the apex of the lung by direct extension from the lowest of the deep cervical glands. Grober has expressed the opinion that when the supraclavicular glands have become affected there is an extension of the disease to the thoracic parietal lymphatic vessels. This is followed by an inflammatory exudation, with consequent involvement of the visceral pleura and apex of the lung. George B. Wood[41] has expressed the opinion that when the supraclavicular glands soften and a periadenitis takes place the neighboring pleural apex becomes infected by continuity of tissue. A similar view is held by Philip.[42] He suggests that an analogous condition is found in the passage of infective material from the liver into the lung. In connection with this method of pulmonary infection James Ritchie[42] has drawn attention to the possibility of the tubercle bacilli being drawn into the lung by a process of suction. If the respiratory pump fills the heart at every inspiration in consequence of the relief which is thereby given to the elasticity of the lung, why should there not be a similar suction process taking place from the lymphatics all around the lung? He is of opinion that the small tubercles frequently seen on the thoracic surface of the diaphragm in cases of tubercular peritonitis have resulted from the suction of the bacilli through the diaphragm. Consequently, he argues that a similar force may possibly play the same part in connection with apical infection from the deep cervical glands.

The thesis of Grober and Philip has been opposed by Most.[43] If adhesions form between the deep cervical glands and the apex of the pleura, it is natural to expect evidence of such an infiltrating process at postmortem examinations upon patients dying with pulmonary tuberculosis. Most has been unable to find evidence of the same at autopsies. In addition to this

negative finding, Most draws attention to the fact that it is not common to find the cervical lymphatic glands enlarged in pulmonary tubercle. In a large number of postmorten examinations carried out in Breslau he was unable to find evidence of their enlargement, and Abrikissoff, who carried out a microscopic investigation of the glands, confirmed the views of Most as to the rarity of antecedent cervical gland tubercle. Our own observations on this point are entirely clinical, and are based upon the examination of a large number of cases of laryngeal tuberculosis secondary to pulmonary disease. In these cases of phthisis pulmonalis we have frequently commented upon the absence of cervical gland enlargement.

Reference has already been made to the occurrence of tuberculous disease of the nasal mucous membrane, and we have had an opportunity of observing it in fifty-six cases. The majority of these cases were classified as lupus, in which the destructive process is slow, and in which tubercle bacilli are found with difficulty. The disease which affects mainly the anterior part of the nasal cavity was often associated with a similar condition of the mucous membrane of the soft palate, fauces, and posterior pharyngeal wall, and in some cases with a similar condition in the larynx, especially of the upper aperture. Our object in referring to it at this point is for the purpose of drawing attention to the fact that the disease may exist for years in these situations without any general systemic infection taking place. Of the fifty-six cases investigated, we know only of two in which pulmonary tuberculosis developed. The ages of the patients varied from 7 to 56 years, and in many of them the disease had existed for a great number of years, varying from one to twenty years. We have been struck further in these cases with the absence of any marked enlargement of the cervical lymphatic glands, and with the general good health enjoyed by these patients. Thus in a patient 29 years of age the nose had been affected for twenty years, yet glandular enlargement was not observed. Although the disease affected the anterior part of the nasal septum and the vestibule, and consequently lay anteriorly to the main lymphatic drainage of the nasal mucous membrane, it must be borne in mind that the lymphatics from the anterior part of the nasal mucosa pass eventually into the deep cervical chain of glands by way of the lymphatic vessels of the face and the submaxillary glands. While many of these patients came un-

der treatment, local recurrence of the disease occurred from time to time, and fresh areas of mucous membrane became affected. Nevertheless the inferior deep cervical glands did not become enlarged, nor did pulmonary tuberculosis manifest itself.

We have still to refer to the third proposition, namely, that the cervical glands directly infect the mediastinal glands, and that the bacilli then pass from the latter to the lungs by entering the blood stream in the pulmonary artery after adhesion of the glands to the vessel wall. As already shown, anatomic injections have failed to demonstrate any direct communication between the cervical and the bronchial glands. Aufrecht's work in connection with this subject cannot be lightly passed over, and therefore the possibility of this channel of infection must be considered.

Summary.—In summarizing the second part of our subject, the connection between the nasal and nasopharyngeal lymphatics and the rest of the body, as exemplified by the invasion of the tubercle bacillus, we are forced to the conclusion that further investigation and observation are still necessary. Certain anatomic and clinical facts, however, must be regarded as proved. The lymph drainage of the upper air passages passes through the cervical chain of glands and enters the large veins at the root of the neck; further, the tracheobronchial glands derive their afferent vessels from the mucous membrane of the lower respiratory passages and pulmonary alveoli, while their efferent vessels pass to the large veins at the root of the neck and enter the blood stream. No efferent vessels have been demonstrated between the deep cervical and the tracheobronchial glands.

Both experimentally and clinically it has been shown that tuberculous disease of the cervical lymphatic glands may be derived from infection of the nasal and nasopharyngeal mucosa by the tubercle bacillus. As to the manner in which the bacilli pass from the cervical glands to the lungs two explanations have been offered: first, by way of the deep efferent cervical lymph vessels discharging into the thoracic duct upon the left side of the neck, and on the right side through the right lymphatic duct into the large veins, thence by the right side of the heart and pulmonary artery to the lungs; secondly, by an extension of the inflammatory process from the diseased inferior deep cervical glands directly to the pleura and apex

of the lung. Experimental evidence has been brought forward in support of the extension of the tuberculous disease by the first or anatomic pathway, but we have failed to bring forward pathologic postmortem data in support of direct extension from the cervical glands to the apex of the lung.

The fact that more than one portal of entry exists in the upper air passages increases the difficulty in estimating the actual part played by the nasal and nasopharyngeal lymphatics in distributing infection. Tubercle bacilli may be inhaled into the lungs and the cervical lymphatic glands may be secondarily infected by the bacilli in the sputum entering through the pharyngeal lymphoid tissue. Further, infection by inhalation may take place concurrently with infection of the cervical glands from the nasal mucosa derived from one and the same infective source. Again, the tubercle bacilli may pass through the mucous membrane of the upper air passages and the cervical glands without leaving any evident trace of their passage, consequently this pathway of infection may clinically pass unnoticed.

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LIX.

THE EAR AND SOCIAL HYGIENE.*

By Percy Fridenberg, M. D.,

New York.

One of the most striking signs of our times is the general tendency toward cooperation and correlation of activities, physical, mental, and social. This is reflected in our medical science and art, which is becoming, more and more, a part of communal rather than individual work. While the good physician, still as of yore, sees his main task and duty in the relief of suffering and the cure of disease, he is increasingly interested in and struggling with the broader problems of the health, wellbeing and physical and mental vigor of the community and of the generations to come. Not only treatment, prophylaxis and hygiene, but training, education, rational living, and the propaganda of health must be considered, today, as legitimate spheres of action for the physician.

The function of otology in this wide field is a varied one, and part of the ground, that relating to deafness, deafmutism and the reeducation by lip-reading, and so on, has been one of the most gratifying chapters in the history of modern pedagogics. The part which otologists have taken in this work is too well known to require more than a reference here. There are, however, other fields, which if less vitally important economically, are at least well worth considering from the point of view of social wellbeing, comfort, and ideal civilization. I am thinking of the modern environment and its possibilities, benign and beneficient, for the organ of hearing.

The social factors in the etiology of aural disease and injury, are well known. The industrial evils, the important prophylactic and hygienic axioms are common knowledge, at least to the specialistic professional. But one step still has to

*Read before the American Otological Society, Atlantic City, June 26, 1911.

be taken, the transfer, as far as that is feasible and advisable, of this stock of knowledge to the community, its popularization, generalization, and the formation of a habit, tradition, and custom of good and pleasant conditions of hearing, and, indirectly, of speaking. This popularization of medical knowledge is the last and most important step in its practical application. The medical common sense of an age is the experimental science of its predecessor. In this respect there has been a notable advance in the last generation, and today our community is well informed on matters of current hygiene and has applied this knowledge practically in everyday life, in educational and social and legislative requirements.

The organ of hearing has not been as well treated in this respect as the organ of sight. There is much more consideration for the eye than for the ear, and popular tradition as well as public opinion has been crystalized into a recognition of the importance of favorable hygienic conditions for the preservation of sight and the danger of impairment of vision. The reason for this is, at least partially, no doubt the fact that loss of sight was an obvious and visible loss, and this of course appealed to our age. Again, the loss of sight renders the individual helpless, puts him under the necessity, almost always, of having an attendant, and thus places two persons, in many cases, hors du combat economically. The misfortune and the disadvantage of loss of hearing is less obvious, serious, and pathetic, but scarcely less important. We have not yet realized the necessity of aural comfort and all this implies in omission and commission. The eye has "come into its own," and the community recognizes this in its regulation of illumination, decoration of buildings, legibility of type, and so on. The eye can no longer be insulted, with impunity, by excessive illumination or used abnormally without calling forth a protest from those who know, and today the "man in the street" is one who knows. Our ears, however, have no sanctuary from excessive noise, and there is not even a general recognition of the need of a haven of refuge, an understanding of the meaning of ear strain. We are beginning to reap the fruit of persistent effort in the general recognition by the laity of the dependence of hearing and sound ears, largely on normal upper respiratory tracts, and of these again largely on normal and sufficient breathing.

The influence on mentality of hearing and of its defects is well known. It is remarkable what a marked influence on spirituality and the social psyche even slight deafness has, and the totally deaf instinctively and unconsciously and automatically exclude themselves from social relations and active intercourse with the world. Blindness has no such sequelæ. It has occurred to me that this is foreshadowed and indicated in the phylogenesis of the organ of hearing, which from the earliest stages has been most intimately connected with the cerebrum and has served to mediate a specialized sensation, that of sound or at least of sound vibration. The original rudimentary eye, on the other hand, was merely a patch of intensified and spatially concentrated heat and touch sense, a spot on the skin with extra development which was rather more acutely sensitive than the rest of the body covering.

The significance of hearing for the safety of the organism is marked in even lower forms of animal life. Long before the eye has been developed sufficiently to be of practical service, actual sound waves or vibrations without specific tonal character are able to produce a specific sensation and thus to give a warning to the organism possessed of even a rudimentary ear or otic vesicle. It is noteworthy that the progressive development of the organ of hearing goes hand in hand with the evolution of the sense of balance and rhythm, and with terminal sensory organs reacting to the specific stimuli of motion and gravity. Articulate speech is formed under the control of this double function of sound perception and rhythm which latter for our purposes may be looked upon as the unconscious or automatic recognition of the time element in motion. While the importance of hearing, sensu strictiori, in the development of normal speech is generally recognized, I do not think that sufficient attention has been paid to the significance of rhythm and sense of time, which are undoubtedly concepts or psychic reactions of auditory origin. Rhythmic tone vibrations have a decided and powerful effect on innervational states, both as stimuli and as inhibition, and directly influence such basic muscular processes as respiration and heart action. Indirectly and through the mediation of breath and pulse rate, energy, volition, and finally emotion itself are affected. It is generally accepted that such varying musical influences as a dirge, a military march, a dance tune, produce

their characteristic effect, independent of intellectual processes and concepts, by labyrinthine stimulation. It stands to reason that this basic and elemental reaction may be reenforced in various ways and most diversely by the psychic processes to which it gives rise and may then appear as a germ of emotion, idea, or conscious volition. The sense of time and of time measure,—what the Germans call "Zeit-mass" to distinguish it from the abstract and pervading continuity which, like tide, "waits for no man"—is of aural origin, and while space concepts and those of space measure or size and dimension are basically visual, there is no doubt that they are largely influenced by, and that their accuracy depends mainly on, number concepts of a fundamentally aural origin. The aural coefficient or factor in the mechanism of speech has been referred to. I believe that there is a similar relation to written or pictured language and to the formation of the alphabet. Briefly stated, my theory is that the specific sounds of letters (or possibly, at first, of characteristic syllables or monosyllabic words) were produced as a result of, one might almost say, in the course of descriptive and illustrative mouth and lip positions, which latter themselves had a specific meaning when interpreted by vision. The sound itself had, originally, no significance for understanding whatsoever, but was, one might say, a byproduct. This invariable accompaniment, however, had its value and an even more wide application than the visual component, as, for instance, in darkness or at a distance, and in the course of time the invariable sound-accompaniment of the mouth position was taken at its face valuation for the symbol and, indirectly, the equivalent of the letter, sound, or syllable. In the reeducation of the deafmute by lip reading, it seems to me, we are retracing this old, old road on which prehistoric man traveled in forming his speech and language. Speech brings up the topic of diction and enunciation, and the value of a good ear and a voice which does not offend. A pleasant voice is almost as important, socially and economically, as a sense of melody and pitch and rhythm, and given the anatomic requisite of normal sound producing organs, the good ear will almost invariably be found to be associated with a good voice. To preserve and develop normal hearing and speech, to prevent aural disease, inferiority or abuse, is the aim of conservative otology.

The bearing of a normal upper air passage and the deleterious influence of abnormalities of nose and nasopharynx is an old story, merely touched on, en passant. There are other factors of modern life which tend to injure the ear and hearing, such as unnecessary noises and the din of traffic which blunt the hearing and, more important, cause a loud, shrieking voice. Dusty, gasoline filled atmosphere, causing chronic nasopharyngeal affections. Lack of respect for organ of speech and hearing, and no insistence on agreeable modulation or low, soft voice in children. Defective teachers and teaching. We are gradually recognizing the economic importance of vision and indirectly of adequate and proper illumination in factories, schools, tenements, but hearing is still left to its own devices. There is need of a crusade against unnecessary noise and of a campaign for fair speech. I shall merely mention the industrial aspect of aurally dangerous trades, sports, and habits; the influence on hearing of environment, altitude, and barometric pressure, of inheritance and hardness of hearing, syphilis and the ear, tuberculosis, and the diseases of childhood which so often lead to grave affections of the ear and jeopardize not only audition but life itself.

LX.

THE RELATION OF AGE TO TONSILLAR INFECTION.*

By Harry A. Barnes, M. D.,

Boston.

In the following paper I have attempted to explain, on purely histologic grounds, the reasons that the tonsil of the infant under one year of age and the tonsil of the adult give rise to fewer infections relatively than the tonsil of childhood. In doing this I have dwelt largely upon the changes of lymphoid activity with age and their effect upon the histologic structure of the crypt.

The crypts of the tonsil are developed as invaginations of faucial epithelium which push their way into the mesoderm in the form of solid buds and are transformed into crypts by a separation and cornification of their central cells which form a core and are expelled into the faucial cavity. The first of these buds begins to be developed about the fourth month of fetal life; but new buds continue to be formed, not only during the remainder of the fetal life, but throughout the first year of infancy. Up to the end of this period, then, we find crypts in all stages of development—solid epithelial buds in which no line of demarkation between the central and outer cells is seen; buds in which the central core has been formed but not expelled; and lastly fully developed crypts.

The above change in the cryptic epithelium is intrinsic in character. Another change, of an extrinsic nature, begins to take place shortly after birth, and is due entirely to the action of lymphoid cells upon the epithelium. At birth the lymphoid tissue of the tonsil is small in amount and not specially active. No follicles are present. A few lymphocytes may be seen wandering through the epithelium of the crypts, which at this

*Candidate's thesis for admission to the American Laryngological, Rhinological and Otological Society.

time is much like the surface epithelium, i. e., it is of the stratified squamous variety, many layers in thickness, compact, and with a perfectly definite basal outline, unbroken by the surrounding lymphoid tissue. At about the fourth month of infancy the lymphoid follicles with their germinal centers begin to show distinctly; vast numbers of lymphocytes are produced, and a correspondingly large number of them find their way into the cryptic epithelium and profoundly modify its character. First the basal outline of the epithelium becomes obscured, and it is difficult to tell where the lymphoid tissue ends and the epithelium begins. Masses of lymphocytes press outward toward the cryptic cavity, and separate the lower layers of epithelial cells from each other, so that they appear as more or less isolated epithelial fingers extending from the surface of the crypt into the lymphoid tissue. (Figure 6.) In places these fingers disappear altogether, being either absorbed by pressure of lymphoid cells, or masked by the large numbers of them. As an end result of this process, we have left only a very thin film of intact epithelium, two or three cells in thickness, lining the cryptic cavity. (Figures 2, 3, 4, 5, and 6.)

This action of the lymphoid cells upon the epithelium of the crypts seems not to be due to any inherent power of motion of the lymphocytes, though they possess that power to a limited degree, but purely to the pressure of numbers. The surface epithelium remains practically unaltered by this pressure, as it is able to expand outward; consequently it is almost always found intact. But the epithelium of the crypt, caught between more or less pressure on all sides, suffers as described above.

At just what age this epithelial degeneration reaches its maximum it is impossible to say, though after the first year and a half of life it is usually well advanced. Throughout childhood it remains essentially the same. At an uncertain age, which we may arbitrarily place at puberty, a general decrease in activity occurs in the lymphoid tissues of the fauces and pharynx. With this decreased activity in the tonsil a certain amount of regeneration of the cryptic epithelium takes place. As the lymphoid follicles with their germinal centers become less numerous and less active, the number of lymphocytes is correspondingly reduced, and pressure on the crypts

is lessened; the isolated fragments of epithelium are allowed to fall together and a somewhat irregular thickening takes place. It is almost never uniform, however, and in places often does not occur at all. But the average unhypertrophied tonsil of the adult has a cryptic epithelium which nearly approaches the infantile or surface type. (Figure 7.)

Turning now to the clinical bearing of these facts, we may consider what the chances of infection may be in each of the types of tonsil described. It must be borne in mind that the tonsil does not always correspond in type with the age of the individual. Many tonsils of the adult have all the characteristics of the tonsil of childhood, and sometimes the infant tonsil shows a precocious development which places it in the childhood group. The histologic structure of the average tonsil, however, corresponds to the age of the individual.

Those cellular or chemical forces of immunity which go under the general name of individual resistance will be disregarded here. Important as they are in deciding the question of infection or noninfection, they act quite independent of structural conditions.

The tonsil of the infant of one year and under seems to offer little chance for infection. The immature crypts, either in the form of solid buds, or with the central core formed but not expelled, are practically impervious to bacteria. The fully formed crypts with their intact epithelium would seem to be almost equally so. Even with a vulnerable epithelium, infection would not be likely to occur, as the amount of cryptic débris at this age is small, and in consequence bacteria are probably comparatively few in number. The reason for this slight amount of débris in the crypts, may be that the number of lymphocytes passing through the epithelium, which cells make up the greater part of the cheesy masses found in the tonsillar crypts of childhood, is small; that cryptic débris is not likely to be retained for any length of time, since the pressure on the cryptic walls due to lymphoid activity is slight, and in consequence good drainage is the rule.

In the tonsil of childhood we find a condition which, if it had been specially devised for the purpose of creating infections, could hardly be improved. With the great increase of lymphoid activity after the first year of life, the pressure on the walls of the crypts must be considerable; it is likely, also,

that it is not uniform but greatest opposite the follicles. The result is that drainage becomes imperfect, retention of cellular débris follows, irregular dilatation of the crypts occurs, and pockets are formed by the backing up of the cryptic contents, which decompose and make perfect nesting places for bacteria of all sorts which may enter from the faucial cavity. Add to this the feeble and degenerated structure of the cryptic epithelium at this age, and the wonder is, not that infection occurs often, but that any tonsils escape it.

The tonsil of the adult is a very uncertain quantity, both as regards its structure and its proneness to infection. Often it cannot be distinguished from the tonsil of childhood, in which case it is as open to infection as the latter; indeed, it may more properly be looked upon as a young tonsil persisting in the adult, than as an adult tonsil. The average tonsil of the adult, however, has undergone to a more or less marked degree those changes in lymphoid tissue and epithelium already described. Cryptic retention is rendered less likely, in part by the diminished pressure of lymphoid tissue on the sides of the crypts and their consequent better drainage; in part also to the decrease in the number of lymphocytes which find their way into the cryptic cavities and are retained as débris. The thickening of the epithelial lining of the crypts, spite of its lack of uniformity, probably exercises a marked influence in preventing the passage of bacteria into the deeper tissues.

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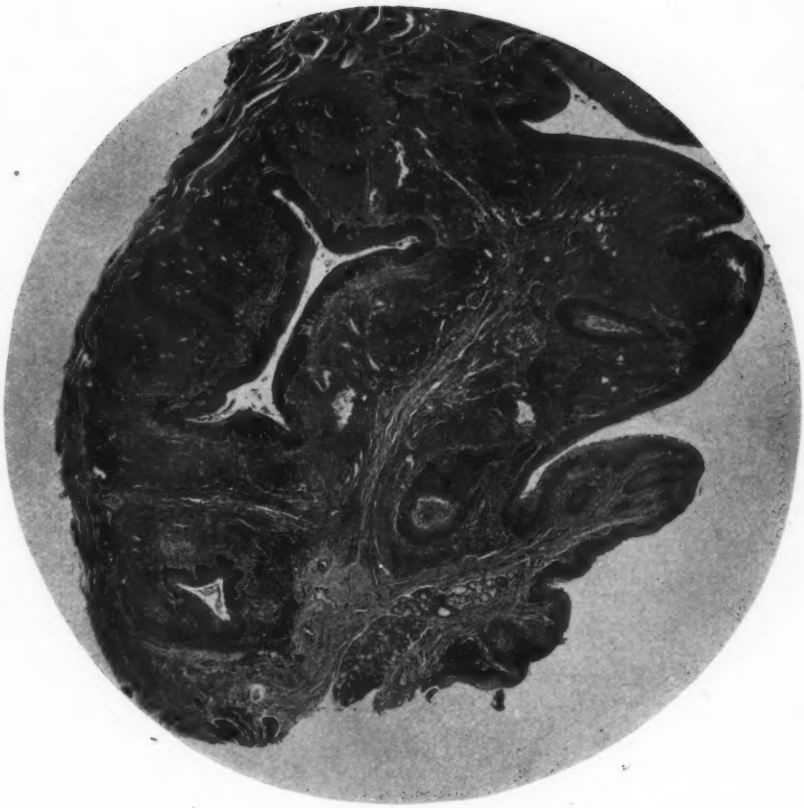

FIGURE I.

Tonsil of infant, age six months. (X 15.) Lymphoid tissue diffuse, with only slight suggestion of follicle formation near lower crypt on left. Cryptic epithelium intact. The two crypts on the right are still in the developmental stage, having central cores formed but not expelled.

FIGURE II.

Tonsil of infant, age eleven months. (X 12½.) Lymphoid tissue beginning to show activity. Follicles with germinal centers are fairly numerous, though they do not show as distinctly as in older tonsils. Crypts are in all stages of development. Cryptic epithelium for the most part intact. The two large crypts in the upper right quadrant show marked degeneration of the epithelium.

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FIGURE III.

Field from Figure II. (X 29 1/6.) Shows follicle formation and degenerative changes in the epithelium.

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FIGURE IV.

Field from Figure II. (X 66 2/3.) Epithelium of crypt on left nearly intact. The crypt on the right shows extensive epithelial degeneration.

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FIGURE V.

Tonsil of child, age six years. (X 66 2/3.) This section is typical of the tonsil of childhood. Lymphoid tissue very active. Follicles with germinal centers numerous and distinct. Cryptic epithelium reduced to a film; though in places it may be seen extending somewhat deeper below the surface, as shown in Figure VI.

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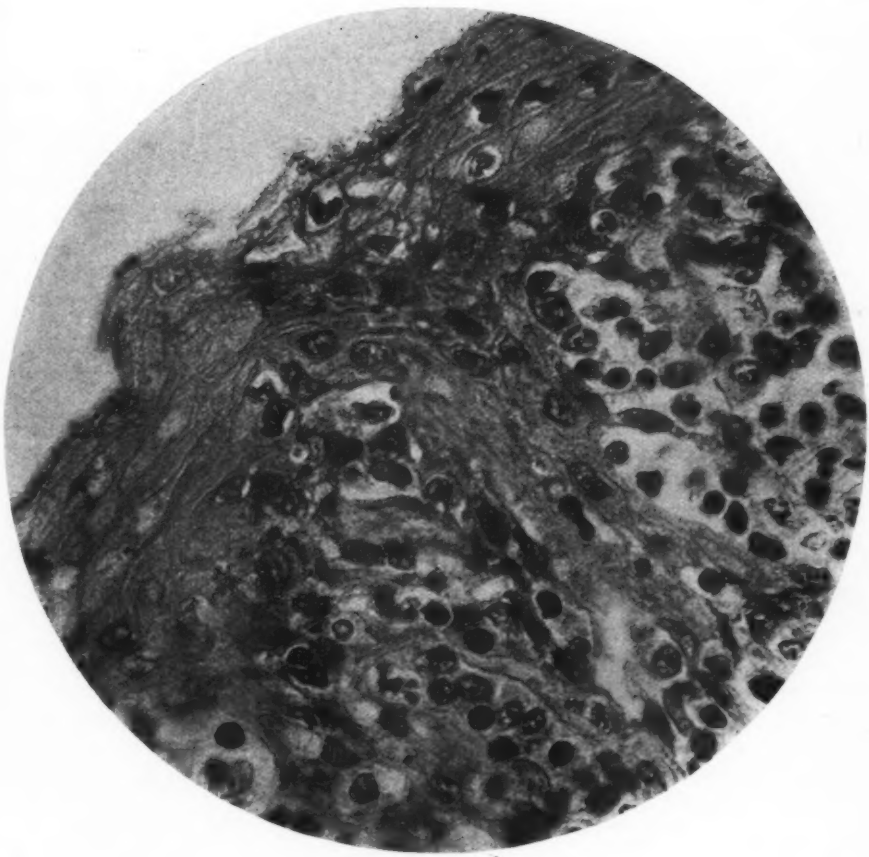

FIGURE VI.

A portion of the epithelium of the crypt shown in Figure V. (X 566 2/3.) Shows the ragged fingers of epithelium extending below the surface into the lymphoid tissue.

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FIGURE VII.

Typical field from regressive tonsil of the adult. (X 66 2/3.) Lymphoid tissue inactive. Cryptic epithelium fairly uniformly thick.

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LXI.

CARTILAGINOUS TUMORS OF THE LARYNX.

By James J. Carroll, A. M., M. D.,

Baltimore.

On the first day of April, 1834, a pale, emaciated laborer, 38 years old, was received in the medical department of the Charité in Berlin. He had been suffering for a long time with cough and expectoration, was unconscious upon admittance to the hospital, and died an hour after his arrival. At the autopsy the following morning it was found that the primary cause of death was a cartilaginous growth, the size of a walnut, filling the cavity of the larynx. This case was reported by Prof. Froriep in the *Medizinische Zeitung*, September 17, 1834.[1] It was abstracted the following year in the *Jahrbücher der In-und Ausländischen Gesammten Medizin*,[2] and also in the *Dublin Journal of Medical and Chemical Science*.[3] In 1837 it was cited by Ryland in a treatise on the Diseases and Injuries of the Larynx and Trachea.[4] Froriep's case has generally been regarded as the first authentic observation of cartilaginous tumor of the larynx, although Macilwain published in the *Edinburgh Medical and Surgical Journal* of 1831[5] a case of a woman, between 50 and 60 years of age, dying from suffocation, whose larynx at autopsy contained a growth strongly resembling a cartilaginous tumor.

In these two instances the true condition was discovered only after death. It is easily intelligible that the diagnosis of internal laryngeal tumors was well-nigh impossible before the use of the laryngoscope. After its discovery by Garcia and its introduction into practice by Türch and Czermak in 1858 and 1859, the number of diagnosticated tumors of the larynx increased rapidly, so that in 1889 Semon was able to collect from various sources 10,747 benign tumors of the larynx. How many of these were cartilaginous is not stated, but we may be sure, judging from subsequent complications, they were very few.

In the early part of 1900 Alexander published in the *Archiv für Laryngologie*[6] a most exhaustive and very authoritative treatise on cartilaginous tumors of the larynx. He reviewed most carefully the previous literature upon the subject, and together with his own cited 26 cases. So thorough was Alexander's work, that it seemed superfluous on my part to go over the ground covered by him. Consequently I have confined myself to publications since Alexander's article, and my search through English, German, and French literature was rewarded by finding the following cases:

1. Witte[7] in 1900 published in the *Archiv für Laryngologie* two cases of ecchondrosis of the arytenoid, which he accidentally came upon in the University Ear and Throat Clinic of Rostock. The first was a man of 45 years, who had upon the anterior side of each arytenoid a small, round growth, measuring about 6 mm. long for the right and about 4 mm. long for the left. The tumors caused absolutely no symptoms and were unchanged in size after five years of observation.

2. Witte's second case was a man 34 years old, who had a small round, hard tumor on the inner side of the left arytenoid, about 4 mm. long and covered with normal mucous membrane. The patient suffered no inconvenience from the growth and no treatment was given.

3. In the 81st volume of the *Annales de la société de médicine de Gand*, P. van Eeckhaute[8] reported a case of enchondroma of the larynx in a man 35 years old, who had suffered with hoarseness and cough for six months following influenza. Hoarseness gradually gave way to aphonia. Patient's larynx was slightly painful. Under the right cord anteriorly was a tumor, size of a pea, growing from the cricoid. The growth was attached by a slender pedicle, immobile and looked like a small cyst. Several attempts at removal with snare were unsuccessful. It was finally removed piece by piece with cutting forceps by the endolaryngeal route. Patient recovered with restoration of normal voice. No histologic examination of the tumor was made.

4. March 18, 1904, Börger[9] presented to the Laryngologische Gesellschaft of Berlin a man, 59 years of age, who was suffering with dyspnea. He had been hoarse for two years and had difficult and painful deglutition for five years. Laryngoscopic examination showed a large, hard subglottic

tumor, which hid the entrance to the trachea except for a small space anteriorly. Diagnosis of chondroma was made. Total extirpation of the larynx was performed by v. Bergmann, March 23, 1904, and on the following day Prof. Fränkel exhibited the specimen before the Berliner medizinsche Gesellschaft, which showed that the plate of the cricoid had been perforated by the tumor. After the operation patient did well for ten days. He suddenly collapsed on the eleventh day and died on the twelfth. The chief findings at autopsy were a fresh purulent peritonitis and a beginning hemorrhagic nephritis.

5. In the *Berliner klinische Wochenschrift* for 1906, Alexander[10] reported a case of enchondroma of the larynx in a man 53 years old, who had for three months on the right side of the thyroid cartilage exteriorly a round mass, the size of a small apple, which though generally hard was soft in places and painful on pressure. Nothing abnormal was seen in the larynx by the laryngoscope. As the patient had no trouble with breathing and no hoarseness, the author tried Roentgen rays temporarily, though he expected an extirpation of the larynx to be done eventually. Slight reduction in the size of the tumor was noticed after fourteen days of treatment.

6. In the 54th volume of the *Münch. med. Wochensch.*, Hartleib[11] published a case of enchondroma of the larynx in a man 45 years old, who had had increasing dyspnea for several months. Laryngoscope showed a large tumor with broad base on the left and posterior walls of the larynx attached to the thyroid cartilage and overhanging the cricoid. Tumor was hard, smooth, covered with normal mucous membrane and filled nearly the entire larynx. Its removal was accomplished by approaching it exteriorly on the side, freeing the larynx well from surrounding structures, then shelling the mass out with a curette submucously without entering the cavity of the larynx. Patient recovered, but with a posticus paralysis on account of which a certain amount of dyspnea continued. Microscopic examination of the neoplasm confirmed the clinical diagnosis.

7. Landwehrmann[12] in the 59th volume of the *Zeitschrift für Ohrenheilkunde* reported a case of ecchondrosis of the arytenoid in a woman 28 years old who had been hoarse for two years. A small hard growth was found on the right cord

posteriorly. A paralysis of the internus was present. Tumor was removed with double curette and found by the microscope to consist of cartilage. Patient recovered with improvement of the voice but not clear speech. Paralysis of the internus remained unchanged.

8. In 1909 Don Mansfield[13] published a very instructive article on cartilaginous tumors of the larynx in the *Archiv für Laryngologie*. Besides referring to eight cases found in literature since 1900, the author described in detail a case of myxomatous chondroma of the larynx which came under his observation. Patient was a healthy man of 50 years, who had difficult breathing for two years, slight pain upon swallowing, and hoarseness. Laryngoscopic examination showed a narrowing of the glottis, swelling of the subglottic mucous membrane, especially posteriorly, and an irregular mass occupying the posterior wall and sides of the larynx. The neoplasm grew from the cricoid cartilage and was somewhat lobulated, some of the lobules being hard, others soft. Its removal was effected by an extensive external operation. When the tumor was curetted away the plate of the cricoid was found perforated down to the muscular wall of the esophagus. Shortly after recovering from the anesthetic, patient complained of severe pain in the chest and died about twenty hours after the operation.

9. In the *Journal de Médicine de Bordeaux* of January, 1910, Moure and Daure[14] published a case of enchondroma of the larynx in a healthy man 62 years old who had noticed an alteration of the voice for six years, hoarseness for two and one-half years, and dyspnea for two years. There was a hard, globular swelling on the left side of the larynx externally. Laryngoscope showed a smooth, round tumor about the size of a mandarin, hiding the greater part of the laryngeal cavity and extending up into the pharynx. Preceded by tracheotomy, operation of thyrotomy together with incision of the thyrohyoid membrane was done under cocain. Tumor grew from the posterior surface of the cricoid and was removed with scissors. As it was too large to escape by the external wound, it was forced into the mouth and expelled by the patient. Recovery followed, but the ultimate effect upon the voice and respiration was not given. Histologic examination confirmed the diagnosis.

To the foregoing I would like to record a similar case which came under my observation in October, 1907, and which has not been previously published.

L. J. T., white, single, 34 years old, a railroad engineer, had always enjoyed good health until he contracted lues in 1904 and had both primary and secondary lesions. Patient took antisyphilitic treatment for a year, after which he stopped the medicine because he was free from symptoms. Four months before coming under observation patient began to get hoarse, the hoarseness gradually giving way to aphonia. About a month after the hoarseness came on he began to have some difficulty in breathing, and two months later he noticed an enlargement of his throat in the region of the larynx. He came to St. Joseph's Hospital, October 26, 1907, to find out the cause of his hoarseness. Examination showed the patient to be in excellent physical condition, all organs normal except the larynx. He was aphonic and had some difficulty in breathing, which was aggravated by the recumbent position and by walking. He had a short, quick, metallic cough, which was made worse by lying down. There was no difficulty nor pain upon swallowing. Exteriorly there was a swelling over the thyroid cartilage on the left side. No glandular enlargements were felt in the neck. Laryngoscope showed a large rose colored subglottic tumor. Its surface was even, smooth, clean, and free from ulceration. It lay just under the vocal cords, attached loosely to the under surface of the posterior half of the right cord and firmly connected with the posterior two-thirds of the left cord. The apex was free, rounded, and came within 5 or 6 mm. of touching the anterior wall below the commissure. The base was attached to the posterior wall and to a slight degree to the lateral walls. The right cord was congested and moved pretty freely but not entirely to the middle line. The anterior third of the left cord was free from congestion but the cord itself was fixed to the side of the larynx. The right arytenoid moved freely on attempt at phonation, but the left had only a slight motion, of a rotary character, with no approximation to the median line. There was a little thin mucus about the laryngeal cavity but no mucopurulent secretion. A few drops of cocain and adrenalin, injected into the larynx, made no change in size or contour of the tumor. A radiograph taken by Dr. H. Ashbury showed

very clearly a more or less circular shadow, the upper boundary of which was about on a level with the middle horizontal plane of the thyroid cartilage, and the lower boundary fell a little below the ring of the cricoid. The anterior border was free, while posteriorly the shadow of the tumor was continuous with the shadow of the cricoid plate.

As the patient had had syphilis, he was put on antiluetic treatment for a month, although the larynx did not present a picture which in any way resembled the usual syphilitic lesions of the larynx. The growth was also not malignant in appearance. Of the benign tumors it suggested most strongly a chondroma or an internal struma. A positive diagnosis between these two was not ventured without a histologic examination. The patient was exhibited before the Rhino-Laryngological Section of the Baltimore City Medical Society, November 29, 1907.

The large size of the tumor and its position below the cords precluded the possibility of removing it by an endolaryngeal operation, the external operation was therefore decided upon. A preliminary tracheotomy through the third ring was done on December 11, 1907. On the 14th laryngofissure was performed by the late Dr. I. R. Trimble, with the patient under chloroform. A vertical incision was made in the skin in the median line from the hyoid bone to the second ring of the trachea where it joined the tracheotomy wound. After the thyroid cartilage, the cricothyroid membrane, and the cricoid cartilage were well exposed, a vertical section was made through the last two, exposing the lower part of the tumor. The growth filled almost the entire subglottic space, leaving only enough room between the apex of the tumor and the anterior commissure to pass a grooved director. The lower surface of the growth was smooth, pale red, slightly irregular and free from ulceration. To expose the mass satisfactorily the section had to be extended upwards through the entire thyroid cartilage, which was exceedingly hard to cut. With the sides of the thyroid cartilage pulled apart, ample room was obtained for manipulation. Laryngeal reflexes were abolished by cocain and the bleeding checked by adrenalin. Tumor was quite firm to the touch. Its free border faced anteriorly and to the right, the attachment being posteriorly and along the left wall of the larynx. The enveloping mem-

brane, largely mucous membrane, was opened at the apex. A grayish white granular material oozed through this opening, not unlike boiled grits in appearance and consistency. The bulk of the tumor was removed with curette and most of the enveloping membrane with scalpel. After the use of the curette the plate of the cricoid was seen denuded of mucous membrane and perichondrium. The exact site of the growth was the left half of the cricoid plate, the posterior half of the cricothyroid membrane, and the adjacent thyroid cartilage. The origin was evidently from the cricoid, the thyroid being affected by extension. The tumor was as large as a medium sized English walnut, measuring about an inch in both vertical and horizontal diameters. Its upper surface under the cords was more flattened than the lower facing the trachea. In closing the wound the sides of the thyroid cartilage were brought together with silver wire. The cricoid ring was not sutured and the tracheotomy tube was brought up from the tracheotomy wound and inserted here, the original wound in the trachea being allowed to close. The tube caused a good deal of pain and cough and was removed on the second day after the operation. Wound was firmly healed on the twentieth day. Patient recovered with a much improved voice, good easy breathing, and no cough. Perfect vocal function could not be expected on account of the unavoidable destruction of a good part of the left cord. At this writing there is no evidence of recurrence. A histologic examination of the tumor was made by Dr. E. H. Hayward, whose report is as follows:

"The specimen consists of several small fragments of tissue, pink in color and of the consistency of muscle. There is no evidence of any old calcareous deposits on cutting the prepared specimen. Histologically there is seen a groundwork of material similar in structure to hyaline cartilage. Scattered throughout this are irregular nests of cartilage cells, many spindle shaped fibrous tissue cells, areas of myxomatous degeneration with fairly numerous stellate cells, and some small calcareous deposits. The most numerous and characteristic elements are the cartilage cells. They are rather atypical and show no regularity in arrangement. They are collected in scattered masses, separated by immature fibrous tissue and by elements of degeneration. Many of the cells are without capsules."

In an analysis of the foregoing cases, we are struck with the following points: In the first place, it is noteworthy how often this type of laryngeal tumor occurred in the male, nine out of ten cases being in men. In regard to age, the youngest patient was 28 years and the oldest, 62. Between 21 and 30 years inclusively there was one case; between 31 and 40, three cases; between 41 and 50, four cases; between 51 and 60, one case; between 61 and 70, one case. The average age was 43. The tumor had its origin in the cricoid five times, in the thyroid, twice, and in the arytenoid, three times. In two instances the plate of the cricoid was perforated by the growth. Although any part of the cartilaginous framework may be affected, a decided preference is shown for the cricoid. Only in one instance was the affection multiple, case No. 1 having a growth on each arytenoid. The tumor in every instance was of slow growth. In one case, No. 5, the swelling was situated entirely on the outside of the larynx. In two, No. 9 and No. 10, swelling was noticed externally as well as internally, and in seven cases there was no enlargement externally. The tumor varied in size from a pea to a mandarin. It was generally found hard, in only one instance were there areas of degenerative softening palpable. It was covered with pale red mucous membrane, which was normal throughout the laryngeal cavity except in one case, where it was described as thickened and swollen. In no instance was the mucous membrane ulcerated. The movements of the cords were unhampered in three cases, while in the other seven there was more or less curtailment of the normal action. Paralysis of the internus was present in one instance. The chief symptoms were alteration of the voice, gradually developing hoarseness, aphonia, embarrassed breathing, attacks of suffocation, difficult deglutition. Cough and pain were present in two cases. In two out of the ten cases there were absolutely no symptoms at all. General health of patients was not affected. In regard to treatment, in two instances there was none. Roentgen rays were tried in one case. The internal or endolaryngeal method of operating was followed in two cases. In one the double curette was used, in the other the cutting forceps. In five instances the external operation was performed, total extirpation of the larynx once, shelling out growth submucously once, and laryngofissure three times.

The results of the seven operations were as follows: Of the two operated by the internal method, both recovered, one with restoration of the voice, one with hoarseness. Of the five cases operated upon by the external method, two died and three recovered. Of the recoveries, one had a posticus paralysis with some dyspnea, another hoarseness, and the ultimate effect on the voice in the third case was not stated. Histologic examinations were made in five of the operated cases.

According to Virchow[15] a cartilaginous tumor is called by the generic term chondroma, and is divided into ecchondrosis and enchondroma. The former is a homogeneous mass growing from preexisting cartilage,the latter, a heterogeneous mass springing either from a noncartilaginous matrix or from cartilage which does not normally belong where the neoplasm starts. Virchow's definition is practically the same as held by pathologists today. Applying it to laryngeal tumors we see that an enchondroma of the larynx is a misnomer, and the term should be discarded because cartilaginous tumors of the larynx grow from preexisting cartilage. In regard to the term ecchondrosis, it is the opinion of many pathologists that this name should be reserved for those small overgrowths occurring in cartilage, which are not real tumors any more than exostoses are real tumors. Ecchondroses occur in the larynx. The two cases reported by Witte, the one by van Eeckhaute, and the one by Landwehrmann probably come under this class, and strictly speaking, are not genuine neoplasms. In addition to these pseudotumors there are three distinct kinds of cartilaginous growth in the larynx. The first grows to a considerable size out from cartilage without materially affecting the matrix from which it grows. To this the term ecchondroma, met with in Ribbert's[16] work on tumors, seems particularly fitting. As examples of ecchondroma may be mentioned three cases of our series, namely, Hartleib's, Moure and Daure's, and Carroll's. The second kind of tumor grows from cartilage and invades to a considerable extent the mother substance. Alexander suggested to call such tumors of the larynx chondroma, and many writers have followed his suggestion. As examples of laryngeal chondroma may be mentioned the cases reported by Börger and by Alexander. The third class is that of mixed tumor, in which some other tissue than cartilage develops independently in the tumor mass. The case reported by Don Mansfield may be taken as a good example of this.

In the fourth edition of Moritz Schmidt's[17] Krankheiten der oberen Luftwege, chondroma of the larynx is classed among malignant tumors. Although it has been known to recur and even to metastasize, it is not regarded by pathologists as malignant in the sense of being an invading tumor and is still generally looked upon by them as benign.

The etiology of chondroma of the larynx still remains in doubt. That a previous inflammation of the laryngeal mucosa has any causative connection with a subsequently developing tumor in the cartilaginous framework of the larynx is extremely doubtful. Nor have we sufficient evidence to believe that traumatism, syphilis, or tuberculosis has any direct bearing upon the occurrence of this neoplasm. In only one case of our compilation was there a history of previous syphilitic infection. It is rather striking how frequent cartilaginous tumors of the larynx occur in the male and how seldom in the female. It is also noteworthy that the time of life, at which most of these tumors occur, is between 40 and 50. According to Schoetz[18] ossification of the larynx occurs oftener in men than in women, and the time this change takes place is in the fifth decade of life. This tendency in the adult larynx towards ossification is perhaps not essentially different from the changes which take place in cartilage in other parts of the body at that time of life, and has probably no causative connection with cartilaginous tumors of the larynx. The opinion therefore of Bertoye that cartilaginous tumors of the larynx are an expression of an altered physiologic process is probably without foundation.

A study of the ten cases already mentioned in this article and of Alexander's twenty-six cases will show that chondroma of the larynx has a definite symptom complex. The nature and location of the lesion suggest of themselves alteration of voice and respiration. If the growth is small and not situated in the chink of the glottis, there may be absolutely no symptoms, as illustrated by Witte's two cases. If the tumor is large enough to obstruct the passage of air through the larynx, or even if small, is so placed as to interfere with the normal adaptation of the cords, there will be first an alteration in the tone of the voice, later hoarseness, and at last aphonia. Synchronously with increasing hoarseness, breathing ceases to be an unconscious act and becomes more or less difficult, which is noticed

by the patient in shortness of breath, particularly after a little exertion. This difficulty of respiration increases to dyspnea, then to paroxysms of suffocation, which if unrelieved will sooner or later prove fatal. If the tumor be situated so as to press upon the esophagus, some difficulty and even pain may be felt upon swallowing. Furthermore, a cough may at times be present as the result of local irritation. The general health is not affected until near the end, when the respiratory act is greatly embarrassed. At this stage too a bronchitis may develop. As a rule the growth of the tumor is very slow and it is remarkable what size such a tumor may attain before it causes either local or general disturbance. In those cases where large tumors were found almost filling the entire laryngeal cavity without inducing suffocation or even very marked dyspnea, one is somewhat surprised at the disparity between the grave pathologic condition present and the absence of urgent symptoms. It must be remembered, however, that as such changes in the larynx take place very slowly, the patient is able to adapt himself to prevailing conditions and so continue to live quite a long time without great distress.

Chondroma of the larynx may be diagnosed in the majority of instances. If the tumor be situated externally on the outer wall, as in case 5, the hardness of the mass, its intimate connection with the cartilaginous framework, and the absence of enlarged lymphatic glands in the neck will justify a diagnosis. It must be remembered, however, that in malignant disease of the larynx cervical glands may be involved only late in the disease, as pointed out by Fränkel. If the cartilaginous tumor occupies the interior of the laryngeal cavity, diagnosis will be largely a matter of inspection and use of the probe. By the latter, its characteristic hardness is made out. By the laryngeal mirror or by direct laryngoscopy it will be seen that the growth is red or rose colored, and covered with normal mucous membrane. If the tumor is large, the mucosa will be stretched and the underlying tissue will shine through, giving the mass a pale rose appearance. In case 7 the mucous membrane was swollen near the attachment of the tumor, but as a rule the laryngeal mucosa is normal throughout. This is of great importance, as it distinguishes chondroma from all ulcerative diseases of the larynx, such as the second stage of malignant tumor, tuberculosis and syphilis. From malignant growth even in the

first stage it ought not to be very difficult to differentiate chondroma, except perhaps when it is to decide between chondroma of the lateral thyroid wall and early carcinoma of the ventricle with prolapse. Even here the infiltrating base would probably betray the malignant character of the trouble. Cysts of degeneration may occur in chondroma, and Alexander says that a cystic chondroma may be hard to distinguish from carcinoma, though the latter develops more rapidly than the former. More difficulty, however, will be met when distinguishing cartilaginous from other benign tumors of the larynx. The hardness of chondroma tends to separate it from papilloma, and the regular smooth contour of the former, occurring only in adults, is in sharp contrast to the irregular, lobular surface of papilloma, which is found most frequently in children. A fibroma is a hard tumor, and its most common seat in the larynx is on the anterior half of the cord. Chondroma, on the other hand, could never arise from the cord any farther forward than the anterior limit of the processus vocalis. Angioma may be easily distinguished from chondroma by its dark brownish-red color, its uneven, mulberry-like surface, its compressibility and its soft consistency. Struma or accessory thyroid occurs in very rare instances in the larynx, and as it presents itself as a subglottic tumor with smooth surface and normal mucous membrane, it may be mistaken for chondroma. The hardness of the latter and the intense red color of the former may be distinctive, but a microscopic examination will probably be necessary for a positive diagnosis. Lipoma with its softness and elasticity may be sufficiently characteristic when contrasted with the decidedly unyielding hardness of chondroma. A fibrolipoma, however, containing much connective tissue, may resemble chondroma so closely that a naked-eye diagnosis may be impossible. Myxoma, fibromyxoma, and amyloid tumors of the larynx may present almost insuperable difficulties for differential diagnosis. In all cases of doubt the safest means is the microscope, and a small piece of the tumor may be removed for examination. This perhaps applies to all neoplasms of the larynx except vascular tumors like angiomata, where the removal of tissue in situ by cutting instruments through the natural route might induce hemorrhage which would be difficult if not impossible to check.

The prognosis of laryngeal chondroma is good. Before the

days of the laryngoscope all such cases ended fatally. Since diagnosis by inspection was made possible by that instrument most of the cases have been cured. With greater familiarity of the laryngoscope on the part of the general practitioner, all tumors of the larynx would be diagnosed much earlier. Every case of hoarseness or even alteration of the normal voice without apparent cause should be carefully investigated. If such were made a rule laryngeal tumors would come under treatment earlier. Small cartilaginous tumors have certainly a better prognosis than the large, though even the latter are within the possibility of perfect cure. Recurrences are rather infrequent.

Treatment of cartilaginous growths of the larynx may be said to be surgical. Drugs are entirely inert, Roentgen rays have not been tried sufficiently to justify any opinion of their value, and radium, as far as the writer knows, has not been tried at all. Removal by instrumentation is the proper treatment at present. If the tumor is small, especially if it is more or less pedunculated, it may be removed with cutting forceps or some similar instrument by the endolaryngeal route. If medium sized, the growth may be best attacked by direct laryngoscopy. If large it will require the external operation, thyrotomy or laryngofissure. In case the cricoid plate is the seat of the tumor, care must be exercised not to use too much force with the curette in removing the growth for fear of perforating into the esophagus. In the rarer instances where the laryngeal framework is extensively invaded by the neoplasm, a partial resection or even total extirpation of the larynx may be necessary.

In conclusion the following recommendations are suggested:

1. There should be uniformity of nomenclature. The term enchondroma should retain the meaning given it by Virchow and should not be applied to growths of the larynx, these being either chondroma, ecchondroma, ecchondrosis, or mixed tumor.

2. Ecchondroses of the larynx should be regarded as overgrowths of cartilage, not real tumors.

3. Although chondroma has been known to recur and even to metastasize, it is not an invasive neoplasm in the broad sense of the term and should be looked upon rather as benign than malignant.

4. Although the clinical aspect of the disease is quite definite,

the etiology is still much in doubt. In 1888 Bruns said "cartilaginous tumors of the larynx are so rare that the study of every case is of the greatest value in order to establish the clinical course of the disease and to furnish data for proper therapeutic measures." The clinical course of the disease has been pretty clearly determined by the various cases published since Bruns' article. The histologic and pathologic phase of the subject has been well brought out by Alexander's work. The etiologic phase, however, lags behind and invites further work and careful investigation.

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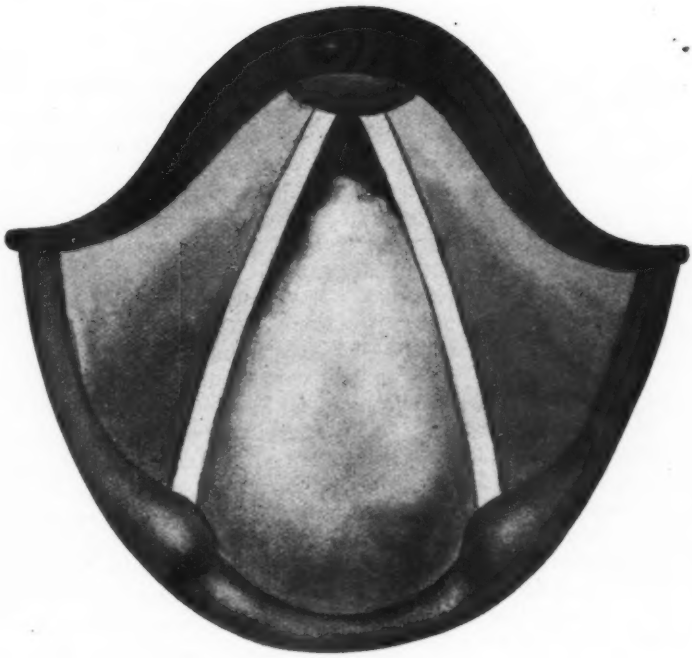
No.	Author and Literature.	Sex and Age.	Location of Tumor.	Appearance of Larynx.	Symptoms.	Treatment.	Result.	Histologic examination	Author's Diagnosis.
1	Witte. Arch. of Laryn., vol. XI., 1901.	Male. 45.	Arytenoid.	Round, hard growth on anterior surface of each arytenoid; right about 6 mm. long, left about 4 mm. Mucous membrane normal.	None.	None.	No increase in size in 5 years.	Not made.	Ecchondrosis
2	Witte. Idem.	Male. 34.	Arytenoid.	Round, hard growth on inner side of left arytenoid, 4 mm. long. Mucous membrane normal.	None.	None.	Not given.	Not made.	Ecchondrosis.
3	VanBeckhaute Ann. d. l. soc. de Med. de Gand, 1902, vol. 81.	Male. 35.	Cricoid.	Hard growth, size of pea, under right vocal cord anteriorly; pedunculated, immobile.	Hoarseness and cough for 6 months. Later, aphonia. Slight pain in larynx.	Removed with cutting forceps	Removed; restoration of voice	Not made.	Enchondroma.
4	Boerger. Berl. klin. Wochensch., 1904, vol. XLI.	Male. 50.	Cricoid.	Larynx filled with hard tumor, covered with pale but otherwise normal mucous membrane; movement of right cord slightly restricted.	Difficult deglutition for 5 years. Hoarseness for 2 years. Difficult breathing, later dyspnea and attacks of suffocation.	Total extirpation of larynx.	Death 12 days later.	Not made.	Chondroma.
5	Alexander. Berl. klin. Wochensch., 1906, XLIII.	Male. 33.	Thyroid.	Large hard mass on right side of thyroid cartilage externally; nothing pathologic in interior of larynx.	Tumor painful on pressure. No hoarseness. No difficult breathing.	X-ray	Slight decrease in size.	Not made.	Chondroma.

No	Author and Literature.	Sex and Age.	Location of Tumor	Appearance of Larynx.	Symptoms.	Treatment.	Result.	Histologic examination	Author's Diagnosis.
6	Hartlieb. Munch. med Wochensch., 1907, LIV.	Male. 45.	Thyroid.	Tumor, size of large nut, on left and posterior wall of thyroid, extending to cricoid, covered with normal mucous membrane.	Increasing difficult breathing, made worse by exertion.	Shelling out submucously.	Recovery. Posticus paralysis.	Made but no details given	Enchondroma.
7	Landwehrmann Zeits. f. Ohr., 1909, LIX.	Female. 28.	Arytenoid.	Hard growth on right processus vocalis, several mm. long and about same wide.	Hoarseness for 2 years. Paralysis of internus.	Removal with double curette.	Recovery. Paralysis of internus.	Made but no details given	Ecchondrosis.
8	Don Mansfeld. Arch. f. Laryn., 1909, XXII.	Male. 50.	Cricoid.	Mucous membrane on posterior wall below glottis swollen Tumor encroached very much upon lumen of larynx.	Difficult breathing for 2 years. Hoarseness. Pain upon swallowing.	Intubation. Later laryngofissure.	Death 20 hours after operation.	Cartil. cells in capsule. Stellate cells	Myxomatous Chondroma.
9	Moure and Daure. J. de Med. de Bordeaux, 1910, XL.	Male. 62.	Cricoid.	Larynx filled with hard, round, smooth tumor. Mucous membrane normal. Swelling on left side of larynx externally.	Alteration of voice for 6 years. Hoarseness for 2½ years. Dyspnea for 2 years.	Preliminary tracheotomy. Laryngofissure under cocain	Recovery.	Cartil. cells in hyaline matrix. Few stellate cells	Enchondroma.
10	Carroll.	Male. 34.	Cricoid	Firm growth filling the subglottic space, covered with normal mucous membrane. Left cord fixed. Imperfect motion to right. Enlargement of right side of thyroid cartilage externally.	Hoarseness for 4 months. Aphonia for 3 weeks. Difficult breathing for 3 months. Cough.	Preliminary tracheotomy. Larygofissure.	Recovery. Persistence of hoarseness.	All forms of cartil. cells. Hyaline with mucoid degeneration. Some calc. and bony deposits.	Ecchondroma.



LXII.

A CASE OF MULTIPLE FOREIGN BODIES IN THE SMALLER BRONCHI.*

By F. E. Hopkins, M. D.,

Springfield.

Bronchoscopy is sufficiently recent, and individual cases vary so greatly in the range and difficulty of the problem presented, as to warrant the recording of each case. The following case was inevitably fatal and falls into the class of the interesting rather than instructive:

E. U., girl, four years old, with a history of having inspired a peanut, was courteously referred to me by Dr. W. G. Craig, of Springfield, on June 5th, 1910. On the chance that the foreign body might be of a character to be located by the X-ray, Dr. Van Allen made an examination, although he stated that if it were a peanut no shadow would appear, and the plate proved to be negative.

Bronchoscopy showed no foreign body in the trachea or in either right or left bronchus. This outcome was highly disconcerting. The history was clear—the child, in the presence of both parents, was eating peanuts when it coughed, and on the deep inspiration following was thrown into great distress, breathing with much difficulty and coughing violently. The cough ceased after about half an hour, but there was no relief to the labored breathing. The hospital records, made when the patient was received, mention marked retraction of chest walls on inspiration, wheezing and whistling rales over both lungs, small area of dullness above right nipple. Temperature normal, and pulse 100. The bronchoscopy proving negative, I was at the limit of my resources, nor could other members of the hospital staff give aid.

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*Read at the Thirty-third Annual Congress of the American Laryngological Association, held at Philadelphia, May 29th to 31st, 1911.

After two days the patient's condition being yet more desperate, bronchoscopy was repeated, Dr. Dudley Carleton, surgeon on service, being present to do a tracheotomy, that a shorter, wider tube might be used if this seemed advisable. As in the first instance, examination of trachea and right and left bronchi was quickly and easily made and tracheotomy was not done.

The child died an hour later, and autopsy showed many small fragments of the nuts scattered throughout the lungs, and around each fragment a congested and hemorrhagic area. Twenty-four of these fragments with their pneumonic areas were counted. Instead of a single nut occluding the trachea or larger bronchi, the many fragments of the well-chewed nut were shot into the smaller bronchi.

For the notes on this unusual case I am indebted to Dr. H. A. Schneider, house surgeon of the Springfield Hospital.

LXIII.

CONTRIBUTION TO PASSIVE IMMUNIZATION IN DIPHTHERIA OF THE UPPER RESPIRATORY ORGANS.

(PRELIMINARY REPORT.)

By Henry Lewis Wagner, M. D.,

San Francisco.

Induced by the experiments of S. Dserzgowsky* in the active immunization of the upper respiratory tract against diphtheria, I have tried, on a small number of patients, local passive immunization in acute diphtheria, with results that may be of general interest.

In making these experiments I had two objects in view: (a) to study the effects of the antitoxins on the diseased tissues when locally applied, with the end in view of ascertaining whether results might not be obtained analogous to those now proving so successful in the influencing of infectious meningitis by intralumbar injections;† and (b) to endeavor to prevent or at least to modify the anaphylaxis following the use of high potential serum when applied in small quantities and at brief intervals during the initial stages of the treatment.

The following is the method I have selected and used: Whenever the patient did not show an absolutely clear picture of diphtheria vera secretions were taken from the throat, and from the nasal passages as well, for bacteriologic examination. The nose and throat were then sprayed at fifteen minute intervals with the strongest serum combined with a 3 per cent watery solution of calcium chlorid in the proportion of 1 to 2; 5000 units of serum being used within the first three hours.

*See his last report in Berliner klinische Wochenschrift, 1910, p. 2042.

†As contrasted with the method of subcutaneous or venous injections.

Later the amount employed was determined entirely by the prevailing conditions, the intervals between successive sprays being lengthened.

In this treatment I attach especial importance to the spraying of the nasal passages, as the lymphatic system of the posterior lateral portions of the nose influences the entire area of the Waldeyer glandular ring, embracing the throat and upper larynx.

Whenever the nose was obstructed by swelled tissues a diluted suprarenal capsule solution preceded the serum and calcium chlorid application, so as to permit the latter to enter into the inflamed hollows and crevices.

In cases where examination disclosed the presence of diphtheria, either plain or mixed form, the results from this local treatment were very gratifying; after a few hours the intense venous hyperemia became less; the odor was less fetid and the subjective symptoms were improved; the disease became localized and did not show any tendency to spread further down.

When the disease presented itself at the first inspection as already quite developed, subcutaneous injections of high potential serum were combined with local immunization; comparatively fewer injections were needed, the number being entirely governed by conditions of the affected parts and of the heart.

The question arises, how does the antitoxin, when applied locally, react on the locus morbi? I do not believe that the antitoxin colloids combine here locally with the haptophore group of the toxin molecule, as the toxins are continuously being carried away by the blood and lymph stream throughout the body; very probably we are dealing here with a process of phagocytosis by the aid of bacteriotropins.

The addition of the calcium chlorid to the serum was made with the intent of preventing or lessening the serum disease (anaphylaxis) either in its early or in its late form; with this, however, I have been less successful, though continue to use this combination as calcium ions act as an antiphlogistic (Leo), stimulate the heart (Leo), and increase the power of blood coagulation (Wright).

Apropos of this last point, Weiss and Tsuru have found the index of blood coagulation lowered in diphtheria, a condition which I have observed may persist for some time, and this fact should be given careful consideration whenever a resort to

surgical treatment is deemed necessary in the case of a patient who is convalescing or has but recently recovered from this disease.

I have no difficulty in accepting the view that local passive immunization will lessen the number of diphtheria germ carriers, a most welcome result in view of the fact that this latent form of the disease is very difficult to exterminate.

LXIV.

CIRCULATORY AND RESPIRATORY REFLEXES AND NEUROSES FROM THE UPPER AIR TRACT.

By W. Sohier Bryant, A. M., M. D.,

New York.

The laboratory and clinical observations that have been made upon reflexes and reflex neuroses generally are now sufficiently well correlated to make it possible to demonstrate the vital importance of the upper air tract with respect to its reflex action. The upper air tract here considered includes all parts of the nose, together with the pharynx.

The term "reflex" is a loose one. It is commonly applied to all automatic acts operating in any part of the nervous systems—the cerebrospinal and the somatic or sympathetic—notwithstanding the fundamental etiologic differences of these nervous systems. Abnormal or pathologic reflexes are usually called reflex neuroses. These latter are identical in their action with normal reflexes, the only difference being that the production of the reflex neurosis is abnormally easy, i. e., it occurs with a minimum, less than normal, intensity of stimulation.

The distinguishing characteristic of the reflex is its conservative function. Its most definite purpose seems to be the protection of the organism against foreign and injurious elements. The cough, sneeze, hiccough, vomiting—these are typical protective reflexes arising in the upper air tract at the entrance of dust, smoke, food unfit for consumption, etc. The reflex mechanism guards the body against the intrusion of all harmful agents. Hence the importance of the upper air tract in its reflex action is obvious: it controls the intake of all nutriment, air, water, and food.

In the case of violent irritation of the upper air tract by smoke, noxious fumes or gases, a defensive attitude is in-

stantly assumed; there is cessation of respiration during the expiratory movement, the purpose being to ward off or expel all harmful fumes. Conversely, in obstruction of the upper air tract by foreign bodies, in choking, there is an arrest of respiration during inspiration. The aim here is to take in all the respirable air that can be obtained, so as to prevent asphyxiation. At the same time there is a backing up of blood in the pulmonary circulation, with consequnt lung distention due to inhibited cardiac contraction. This phenomenon has a doubly conservative purpose: first, to increase the capacity of the lungs; and secondly, to reduce the supply of oxygen carried to the tissues, so as to defer complete asphyxiation.

These defensive manifestations of the organism are entirely nonpathologic in their action. They are the response that every normal individual makes to harmful stimuli. Such reflex action can be considered pathologic only when these reactions are produced with very slight stimulation, i. e., when abnormally profound reactions such as have been described are produced without violent irritation. We then have the reflex neurosis.

The chief differentiating characteristic of the reflex neurosis is its destructive action. As a typical neurosis of the upper air tract may be mentioned reflex asthma which concerns both the pulmonary and the circulatory system, causing functional emphysema or pulmonary dilatation and pulmonary congestion. The mechanism of asthma is identical with that of the normal reflex when there is acute occlusion of the upper air passages. This causes dilatation of the lung through impeded expiration and pulmonary blood stasis due to lowered intracardiac blood tension.

The reflex tendency to increase the lung capacity and the retention of respirable air is a conservative measure. The corresponding reflex neurosis—which is destructive, like all reflex neuroses—prevents the individual from using his otherwise comparatively normal respiratory mechanism.

In the reflex neurosis the exciting stimulus starts in the upper air tract and conveys the pathologic centripetal impression through the trigeminus nerve and the sphenopalatine ganglion to their respective centers. The impression conveyed is the same as when the upper air tract is seriously occluded. The centrifugal impulse passes over the pneumogastric to the

heart and the phrenic to the pulmonary apparatus, causing the typical condition of asthma.

For our knowledge of these reflexes we are especially indebted to Grossman of Vienna, who in his experiments upon living animals has demonstrated that through stimulation of the upper air tract by artificial occlusion, normal reflexes similar to asthmatic symptoms may arise. Experimental and clinical observations demonstrate that the asthmatic syndrome may appear in varying mild degrees. There may be slight functional emphysema or slightly impeded expiratory movements only, with moderate engorgement of the pulmonary circulation.

The writer's clinical observations have led him to realize the vital importance of the upper air tract in old age, and in chronic and acute diseases when some of the asthmatic symptoms are present. Total or partial occlusion of the upper air passages in such cases is of the utmost significance to the patient. Even slight contacts between the turbinal bodies of the nose and neighboring surfaces, or hypersensitivity of the mucous membranes without any contacts at all, may be causative of symptoms that in connection with other pathologic conditions will produce fatal results. I believe that not infrequently the reflexes of the upper air tract determine whether or not the other pathologic conditions will terminate fatally or otherwise. Through their inhibitory cardiac action and interference with respiration, these reflexes in many cases augment the gravity of disease to a material extent.

Etiology of the Asthmatic Reflex and Asthmatic Neurosis.—As we have seen, the asthmatic reflex is caused by obstruction of the upper air tract. It is the unconscious expression of nasal stoppage and air hunger. The asthmatic neurosis, or true asthma, is due to hyperesthesia of the mucous membrane of the upper air passages and to a deficiency of inhibitory power in the nerve centers. The deficiency in the nerve centers is usually hereditary, or it may be acquired through exhaustion or toxic irritation. The hyperesthesia of the mucous membrane appears also to depend upon heredity, sensory exhaustion, or overstimulation and toxic irritation. Local causes such as toxic irritation and morphologic irritants, as well as irritation from impure air, may be the cause of the hypersensitivity of the mucous membrane. Asthma is the uncon-

scious expression of the neurotic impression of nasal stoppage and air hunger.

Diagnosis.—The diagnosis of these obstructive and hyperesthetic conditions can be demonstrated in two ways:

(1) By shrinking the engorged tissues with adrenalin to a sufficient degree to open the passages, thus relieving the local surfaces from irritating contact and effecting amelioration of the asthmatic symptoms.

(2) By anesthetizing with cocain the nerve terminations that supply the constricted region or the hyperesthetic membrane.

If either of these methods produces marked amelioration of the pulmonary and circulatory symptoms, a diagnosis of asthmatic reflex or neurosis is justified.

Treatment.—The emergency treatment of these asthmatic cases is limited to local applications. In chronic conditions where time will permit, the nasal contacts, obstructions, and hyperesthetic areas should be removed by the usual therapeutic and surgical methods.

Prognosis.—The results to be anticipated from treatment are improvement of the circulatory and respiratory symptoms —in other words, a profound amelioration of the pathologic conditions. Complete recovery seems to depend upon continued treatment of the upper air passages. Through my clinical experience I have been led to expect that in urgent cases, local applications will afford instant relief varying in length of time from one hour to several hours; and that if life is prolonged and treatment continued, the fundamental pulmonary and circulatory conditions tend to recover. The intervals of relief will lengthen rapidly in response to repeated applications.

Illustrative Cases.—(1) A man forty years old. Nasal breather. Acute infection of the respiratory tract, "grippe." Face white and haggard. Pulse intermitting many beats; almost stopping. Respiration labored and shallow. Temperature 102 degrees. Sensation of suffocation and imminent death; patient apparently in extremis. Foot of bed raised. Subcutaneous injection of strychnin had given no relief. Application of cocain and adrenalin along lower and middle turbinals brought instant relief from subjective symptoms with improvement of respiration and regular pulse. Relief lasted four hours, when there was another attack of dyspnea,

pallor, and heart stoppage. Another nasal application relieved the condition more completely, after which the patient passed to final recovery in a few days.

(2) A man seventy-three years old. Recent fracture of arm from collision with automobile. Pale, heavy, stout man, of senile appearance, nearly bedridden and despondent. Nose breather. Before accident was fairly active and comfortable. Pulse slow, weak. Respiration slow. Nasal inspection showed hypertrophied turbinals, no notable respiratory obstructions, but contacts. Repeated shrinkage of the hypertrophic turbinals by adrenalin and iron salts soon relieved contacts in nose. The circulation and respiration improved, and patient was restored to as good or better health than before accident. In two months the patient was looking and feeling very well and much younger.

Conclusion.—In conclusion I wish to say that unless the upper air tract is in no way obstructed and is not hyperesthetic —which is rarely the case—the patient suffering from emphysematous symptoms and pulmonary congestion is not receiving the attention to which he is entitled if the upper air passages are ignored. Under such circumstances we cannot overemphasize the importance of treating the upper air tract, so as to minimize the danger arising from the reflex neuroses which are so abundantly found to emanate from this region.

LXV.

PNEUMOCOCCUS INFECTIONS OF THE THROAT.*

By Harold Hays, A. M., M. D.,

New York.

During the past two years I have had occasion to see in my practice five cases of a supposedly rare infection which has been little described in the literature. The condition to which I refer is the invasion of the throat by the pneumococcus, the infection giving rise to a clinical picture which in certain instances varies greatly, but in others forms a definite entity.

Rendu and Boulloche in 1891 described two cases of acute pharyngitis with sudden onset, accompanied by high fever of short duration, occurring in individuals who were exposed to pneumococcic infection and slept in the same room. The pneumococcal origin of the infection was proved by the inoculation of rabbits. In neither of these cases was there an ulceration or a false membrane. Cornil described a case of abscess in the tonsil due to the pneumococcus. Jaccoud described a case of pseudomembranous pharyngitis of similar origin. In 1901 Monro described a case of membranous pharyngitis which he considered to be of pneumococcal origin, as also have Bezancon and Griffin, who used the agglutinative serum reaction to prove their case.[1]

Eiliott in the *British Medical Journal,* in a very instructive article entitled "Remarks on Acute Pneumococcus Infection of the Pharynx," describes a clinical picture which conforms very closely to the cases I have seen. He says: "I saw several cases of pharyngitis with fever and considerable enlargement of the cervical glands, the latter being a prominent feature of the cases. The submaxillary lymphatic glands, the deep cervical glands under the sternomastoid, and also glands below the lobule of the ear, were enlarged, forming a mass,

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which, in the early stage, might lead one to make a diagnosis of mumps (an experience which fell to my own lot in one of my cases). The glands on both sides of the neck were enlarged but more extensively on one side. The accompanying fever was not unusually high, 102° to 103°. The onset was sudden; the whole of the back of the pharynx was swollen, red and inflamed. Sometimes the tonsils were considerably enlarged, with follicular concretions visible. The fever was of short duration, about forty-eight hours, with slight rise of temperature in the evening for several days longer."

The author concludes as follows:

1. These cases were not influenzal in origin, for the usual visitation of influenza came later, and several of these cases afterward developed influenza, which ran a typical course.

2. Although no trace of exposure to infection from pneumonia could be found in any of the cases, it was unusually prevalent at the time.

3. In two of the cases where cultures were taken, the pneumococcus was found, and taking into consideration the similarity of the other cases, the remarkable glandular enlargement which was a feature of them all, and the facts that the others were exposed to the same infection as the two investigated, there can be little doubt that the pneumococcus was responsible for all the trouble.

In November, 1908, Sir Felix Semon, in the *Medical Magazine*, described two cases of a hitherto unrecorded affection of the throat caused by the pneumococcus. These cases showed the most surprising fluctuations "between intensely painful inflammatory conditions of the throat and improvements which appeared to render complete and speedy recovery almost a certainty, but which repeatedly gave way to absolutely unexpected aggravations, until finally—in the one case certainly spontaneously, in the other during an iodid of potassium treatment—complete recovery took place." These cases were characterized by profound asthenia, by ulceration of the affected parts, by an almost entirely afebrile course, and by *complete absence of swelling of the cervical lymphatic glands* (italics mine); in the first case the pneumococcus was found in pure culture, while in the second, the pneumococcus predominated. In both cases toward the end "a punched-out loss of substance occurred, whilst by far the greater part of the ulcers healed without leaving any scar behind."

In a later paper[2], this distinguished author relates in great detail an extremely interesting and sad case in which a physician suffered from a pneumococcus infection of the throat with a final complication of laryngeal and pulmonary tuberculosis. In this case ulceration occurred at first in the lateral wall of the throat opposite the last molar tooth. There was also considerable swelling of the lingual tonsil. Fresh ulcerations later developed on the posterior pharyngeal wall and great tumefaction of the vocal cords and arytenoids was present. Examinations bacteriologically of cultures from the pharyngeal ulcerations and inoculations into mice proved the presence of the pneumococcus. "Whilst the pharyngeal specimens were simply teeming with pneumococci without any evidence of tuberculosis, the scrapings taken from the ulcerated spots on the artyenoid cartilage contained large clumps of tubercle bacilli. . . . It seemed, therefore, quite evident that tuberculous infection had supervened upon the pneumococcus infection." The patient died seven months after the onset of the disease. A case of tuberculosis of the larynx, supervening on a pneumococcus infection of the pharynx is unique in the annals of laryngology.

The cases which I have seen personally correspond more closely to those described by Mr. John Elliott, although one of my cases showed a superficial ulceration closely resembling an infection by the spirillum and bacillus of Vincent. In three of these cases, slides and cultures were made and almost a pure culture of the pneumococcus found.

Case 1.—A young man, 24 years of age, whose right tonsil I had removed the year before, came to me after a trip on the road. He told me he was sure he had another tonsillitis and chided me about the work I had done on his tonsil. The left tonsil was very small and had never given him any trouble. Examination of the throat revealed an intensely engorged mucous membrane, edematous and showing a small superficial ulceration on the posterior pharyngeal wall on the left side. The throat was so intensely inflamed and edematous that there was hardly any breathing space, the uvula was twice its natural size and the pillars of the fauces almost came together. I took a smear at the time in order to differentiate Vincent's angina and diphtheria, and immediately made a culture. The smear showed organisms morphologically resembling pneumococci and the culture showed the same organism.

The patient's temperature was 102° F. There was moderate enlargement of the upper cervical lymphatics. I had the patient go to bed, gave him a brisk cathartic, cachets of analgesics, a gargle of peroxid of hydrogen and formaldehyd throat lozenges. The next morning the patient was better, the temperature being down to 100°. Not having had much experience with such cases, and the weather being of the usual inclement kind we have in the middle of winter, I decided he was better off in a hospital, where he went for three days. Much to my relief, with rest in bed and the treatment I outlined above, he recovered entirely.

CASE 2 was another young man of about the same age, who was sent to me by his family physician. This case presented the exact picture described by Elliott. The throat was intensely inflamed and edematous, breathing and swallowing were difficult, the temperature was about 102°, the cervical glands were much enlarged. The patient was intensely prostrated. There was no ulceration present. At first I made a diagnosis of rheumatism of the throat, but taking a smear and culture, as I do in most acute throat cases, I found that the infection was due to the pneumococcus. After giving him some local treatment I sent him home to go to bed, where he remained for two days. After two days more local treatment he recovered entirely.

CASE 3.—A young married woman of twenty-five, about three weeks before her confinement developed a "sore throat." When I saw her she presented all the symptoms of influenza. The symptoms were about the same as those outlined above. On the fourth day she developed an acute otitis in the right ear and later a mastoiditis of pneumococcus infection. Two days later an infection of the left ear took place. She recovered from her nose and ear illness after operation on the mastoid.

The remaining two cases presented similar symptoms, but in these no cultures were taken. However, from the course of the disease in both instances I am convinced that it was due to the pneumococcus.

I shall now enumerate very tersely the general course of pneumococcus infections of the throat, as they developed in my own cases and those of Semon and Elliott.

Etiology.—The infection occurs during the winter months

of inclement weather when pneumonia, influenza and rheumatism are very prevalent, and there is no way of definitely differentiating the condition and stating that the pneumococcus is the cause of the trouble, unless a culture is taken. A peculiar fact is that the disease seldom is complicated by a true pneumonia. Age and sex and general predisposition make very little difference.

Symptoms.—The disease usually comes on suddenly with moderate temperature and intense congestion and edema of the throat, together with an inflammation of the anterior cervical chain of glands. The prostration is usually considerable. Swallowing is painful and the patient constantly attempts to spit out a quantity of thick, tenacious mucus. In a few cases ulceration of the mucous membrane of the pharyngeal wall, uvula or pillars of the fauces may occur. The ulceration is superficial, well circumscribed, covered with a whitish gray film, and is surrounded by a deeply congested tissue. More than one ulceration may be present.

The course of the disease is usually short, terminating by lysis. The mucosa assumes its normal appearance and even though ulceration has occurred it is so superficial that no scarring is left.

Differential Diagnosis.—This condition must be differentiated from diphtheria, Vincent's angina, tuberculosis, influenza and rheumatism. Clinically it is differentiated from diphtheria by the lack of membrane or the circumscribed character of the membrane if one is present; from Vincent's angina it differs by the ulceration being more superficial, the shortness of the illness, by the ulceration not showing a tendency to spread and by the intense surrounding inflammatory reaction; it is differentiated from a tubercular inflammation by the moderate amount of pain and the superficial character of the ulceration; from influenza it is differentiated by its occurrence often when influenza is not epidemic or endemic, by the lack of complications and by the swelling of the cervical lymphatics; from rheumatism it is differentiated by the shortness of the illness and the lack of any rheumatic affection elsewhere. A positive diagnosis can only be made by cultural examinations of the throat.

Prognosis.—Uneventful recovery occurs in most cases, particularly when there is no ulceration. Complications are few

and within five to seven days the patient fully recovers. In one of my cases a mastoiditis occurred; in one of Sir Felix Semon's cases a fatal tuberculosis supervened.

Treatment.—Rest in bed with ice cloths around the neck, is of utmost importance. A brisk cathartic should be given and some form of antipyretic and analgesic is usually necessary to reduce the fever and to overcome the headache and general pain. Local measures, with the exception of nitrate of silver, are of little service. This astringent may be used in mild dilutions to relieve the congestion, but where ulceration is present one can use a 50 per cent solution on the ulcerated area without doing any harm. No warm or heavy food should be taken. The oral cavity can be kept moderately clean and comfortable by gargling with a mild alkaline solution or peroxid, and dissolving a formaldehyd tablet in the mouth every few hours. The most important therapy is rest in bed and ice compresses applied to the neck.

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1. All these references have been taken from a paper by John Elliott in the British Medical Journal, June 26, 1909.

2. Semon, Sir Felix. Remarks on a Case of Pneumococcus Invasion of the Throat. The British Medical Journal, June 26, 1909.

LXVI.

METHODS OF GIVING ANESTHESIA IN OPERATIONS UPON THE UPPER RESPIRATORY TRACT.*

By James T. Gwathmey, M. D.,

New York.

The surgeon operating upon some part of the upper respiratory tract may choose from such a diversity of agents and methods for inducing and maintaining anesthesia, that his final selection in the vast majority of cases should be such as to eliminate absolutely any question concerning the safety or aftereffects of the anesthetic. As the writer was told upon several occasions that the object of this paper was to provoke discussion rather than to emphasize any particular anesthetic or technic, the subject will be treated in a broad and liberal way.

First. The agents used at the present time for local anesthesia are: cocain and its many allies, morphin, ethylchlorid and sterile water.

Whenever possible, morphin should always precede cocain, rendering the latter safer from inhibitory reflexes, improving the anesthetic, and removing the psychic element.

Second. The general anesthetics are: nitrous oxid gas, ether, ethylchlorid, anesthol, chloroform, morphin; and in emergency cases, alcohol in the form of whiskey or brandy, combined with morphin.

The best results are obtained when the agents enumerated above, both local and general, are used in combination and sequence, as indicated by the condition of the patient, the nature of the operation, and the demands of the surgeon.

Third. The methods employed are as follows: spinal analgesia; rectal anesthesia; intravenous anesthesia; regional anal-

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gesia; morphin anesthesia; combined local and general anesthesia; hypnotism, alone or, preferably, mental suggestion combined with other methods; the sequestration method; intratracheal anesthesia; and finally, pulmonary anesthesia by the nasal or oral route, with or without valves and with the gas or vapors under ordinary or positive pressure.

One successful case of a surgical operation upon a human being with electrical anesthesia[1] was reported from Hartford, Connecticut, in April, 1910, but as no subsequent cases have been mentioned, this method cannot be considered as practical at the present time. Few surgeons would think of hypnotism in this connection, but every physician should know that certain persons can be operated upon when in this state. All patients are affected more or less by mental suggestion. This was most strikingly illustrated a few nights ago in a clinic with which I am connected. At my suggestion a phonograph was started thirty minutes before the time for operating, and at that time not one of the group of five to eight children operated upon for adenoids and tonsils, cried or objected in any way to the anesthetic. In another hospital the surgeons united in the effort to eliminate the element of fear by ignoring or denying there is any danger in connection with the anesthetic. The idea being that fear is one of the contributing causes to nausea and vomiting, especially in the induction period. The result of the combined efforts are reported to be most satisfactory. Adults are especially open to mental suggestion after small physiologic doses of morphin.

The sequestration method[2] consists of getting the patient under narcosis with some pulmonary anesthetic and then using the inner tire of an automobile, or preferably the cuff of some blood pressure apparatus, placed at the upper part of the thighs, and also close to the armpits, making pressure, and thus cording off this amount of blood from the body. The patient is then placed in a sitting position. The anemia of the brain thus produced is depended upon to continue the narcosis. The bands are gradually loosened and the anesthetic discontinued or only small amounts used. Anesthesia usually lasts for from five to fifteen minutes, without a reapplication. This method is safe, for if any untoward symptoms appear, a reversal of the patient's position immediately rectifies the trouble. Chloroform is the only anesthetic contra-

indicated with this method. Toward the close of operations lasting an hour or more, a useful modification of this method will be found in the raising of the head of the table slightly, after which very small amounts of the anesthetic will be necessary to complete the operation. In some cases the anesthetic may be entirely withdrawn. A patient under an anesthetic is quickly responsive to changes of body position.

Rectal anesthesia[3] is especially useful in all head surgery. As introduced by Dr. Cunningham, of Boston, and greatly improved and modified by Dr. Sutton, of Kansas City, it is perfectly safe in selected cases. This method has not made very great headway in the last few years. As the anesthetist is compelled to be at the head of the patient in order to note the reflexes, the writer of this article sees no advantage in this method over vapor anesthesia.

Spinal anesthesia seems to be slowly gaining favor. With the perfect technic that now obtains it is comparatively safe. It is less available for head surgery than for other parts of the body. When the head is to be operated upon, the Trendelenburg posture, as suggested by Jennesco, is used to obtain the analgesia. In point of safety it cannot be compared with the best local and pulmonary methods. A German statistician[4] recently compiled for his confreres a series of 2400 cases with twelve deaths. American statistics give much better results.[5]

Intratracheal anesthesia,[6] as introduced by Dr. Meltzer of the Rockefeller Institute, should be encouraged and developed by those composing this association. This method consists in getting the subject under a pulmonary anesthetic and then passing a rubber catheter two-thirds the size of the trachea to its bifurcation and then alternately passing the ether vapor and air through this tube. Upon the lower animals the success of the method is unquestioned. Between fifty and one hundred cases have been reported so far upon human beings. Unfortunately one death has occurred through faulty technic. In the experimental laboratory every requirement of a perfect anesthetic is met: absolute relaxation; infinitesimal amounts of ether; perfect control of the degree of anesthesia; abolishing reflexes or allowing them to appear at will; and the absence of aftereffects. This method of anesthesia deserves every encouragement and a thorough trial; and in the meantime, a suspension of judgment and absence of criticism.

By morphin anesthesia is meant giving a full physiologic dose of morphin and hyoscin, and supplementing this with a few drops of the anesthetic chosen, or preferably with nitrous oxid gas and oxygen at normal pressure. This method is useful when, for any reason, ether or chloroform are strongly contraindicated. Dr. James P. Tuttle, of New York City, in connection with Dr. Jerome M. Lynch, reports over two thousand cases without a single death. The usual dose is one-fiftieth of a grain of hyoscin and one-quarter of a grain of morphin. This is given in two periods, the first gr. 1/100 two hours, and the second gr. 1/100 thirty minutes before the operation. One-quarter of a grain of morphin is added to the second dose. (This last medication is omitted or decreased according to the condition of the patient at that time.) The contraindications to this method are an acute or subacute nephritis; a very rapid heart also indicates smaller doses of hyoscin.

Intravenous Anesthesia.[7]—The first experiments were on animals with the different narcotics and analgesica. Ether in a 5 per cent solution was finally selected as the best agent, used alone or in sequence with isopral. A special apparatus regulates the flow of the anesthetic drop by drop. Not over three hundred cubic centimeters were used with any patient.

Two hundred and fifty cases are reported with no fatalities. The objections stated are the long postanesthetic stage (seven to eight up to twenty-four hours) and incomplete anesthesia and relaxation, increased blood pressure and thrombosis formation in the veins; also lack of control over the dilution of the ether.

Regional Anesthesia.[8]—This method should be used with morphin and some local anesthetic instead of alone. Anemia of an extremity is induced by raising the part, thus emptying the vessels, as far as possible, by gravity. A bandage is then applied from the lesion to the trunk; another below the lesion so that there is an anemic area at least 15 cm. wide. Whenever local anesthesia of an extremity is incomplete by the usual methods, this procedure should be added.

The scientific basis for the successful administration of all pulmonary anesthetics consists, in addition to the usual preparation of the patient: First—Some preliminary medication.[9] Second—Anesthetic so arranged that any sequence or com-

bination can be quickly made without interfering in the slightest with the operation. Third—All anesthetics heated to the temperature of the blood. Fourth—Combined with oxygen when indicated.[10] Fifth—Apparatus so constructed as to be able to administer the gases or vapors under normal atmospheric pressure or positive pressure and with moisture, and either with or without valves.

Preliminary medication given thirty minutes before the operation quiets a patient, as indicated by the normal heart sounds; shortens the period of induction; abolishes unnecessary reflexes and blunts others, including the vomiting center; diminishes the amount of the anesthetic one-third to one-half; renders holding and strapping unnecessary; diminishes the secretion of saliva to a negligible quantity; and finally allows the patient to come out of the anesthetic as in the induction, quietly and naturally. The following plan has successfully been used in connection with morphin:

To relieve the dryness of the mouth and thirst after the operation, one or two pints of normal saline should be given per rectum five to ten minutes before the close of the operation, and while the patient is in full surgical anesthesia. This procedure brings the patient out strong, and usually with no disposition to vomit.

Nearly all patients should have the benefit of the induction of the narcosis with nitrous oxid gas and oxygen.[11] The continuance with this combination would depend upon many circumstances unnecessary to go into at this time. If a change is indicated, an even narcosis can be maintained with warm ether or chloroform and oxygen, while the final stages of any operation lasting one hour or more should be nitrous oxid gas and oxygen. When this plan is followed, in over ninety per cent of all cases the patient will suffer from no unpleasant aftereffects.

Positive pressure, which consists in having the bag or bags holding the nitrous oxid gas and oxygen overdistended and the expiratory valve so regulated that an effort is necessary on the part of the patient to exhale, is indicated for the strong and robust. Valves are used for those below par, while for the very weak and anemic a somewhat open method is usually best.

Dr. S. Griffith Davis, of Baltimore, has supplemented my

own work in the laboratory with warm anesthetics by a remarkable series of observations upon human subjects undergoing surgical operations. In twenty-six patients anesthetized with warm ether and chloroform vapor, the loss of temperature averaged 0.29° F., as against the loss of 1.02° in one hundred and forty cases anesthetized under similar conditions with the open drop method. This data in connection with the clinical effects observed daily by those using the warm vapors, places the vapor method upon a firm scientific basis.

The drop method[12] of ether or chloroform has no scientific basis of clinical facts to sustain it, when compared with the administration of the warm vapors combined with oxygen and passed through water, thus washing out the peroxids, aldehyds and alcohol, and giving to the patient a pure ether vapor. For this reason the statistics collected in recent years referring especially to chloroform should be accepted with very great caution. It has yet to be proven that any pathologic changes follow the administration of warm chloroform vapor with oxygen. The only method with which the vapor can be compared is the combination of nitrous oxid gas and oxygen. Having determined the safest way to administer the anesthetic, it is an easy matter to apply this knowledge so as to get the best results in any given case.

Of all serious surgical cases, the easiest from the anesthetic standpoint is a mastoid operation. A deep anesthesia is required only in the initial stages. The hammering and chiseling in itself seems to have some anesthetic effect, as the vapors can be almost withdrawn and the reflexes allowed to become quite active without the patient evincing any conscious movement. If nausea follows a mastoid operation, the anesthetist has not measured up to his opportunities.

For a submucous operation, the Rose position with warm chloroform vapor and oxygen is preferable when a general anesthetic is decided upon.

A recent visit to some of the principal medical centers in the United States shows a wide diversity of opinion both as to the anesthetic and the operation in the removal of adenoids and tonsils. In the Massachusetts General Hospital the prevailing method seems to be with the patient in the sitting posture. The patient is first anesthetized in the horizontal position, and is then picked up bodily and placed in an ordinary

chair. The operator sits directly in front of the patient, with an assistant immediately behind him, while the anesthetist stands behind the patient, supporting the head and shoulders. As they have surgical chairs that can be thrown up instantly, to which the patient's shoulders can be strapped to prevent slipping when in the sitting position, there is no excuse for using this clumsy method. If the patient comes out sufficiently to annoy the surgeon, the anesthetic is reapplied and the operation continued. The nitrous oxid gas-ether sequence is used. (Chloroform is prohibited in this hospital.)

In Baltimore the horizontal position is used throughout. The nitrous oxid gas-ether sequence is used to get the patient under, and a continuous narcosis maintained by the warmed vapor method, using nasal tubes. The anesthesia is perfect, the operator taking his time, grasping with artery forceps and tying every bleeding point, as in an abdominal operation. Each case consumed between thirty and sixty minutes. Certainly no alarm from bleeding could be felt after the patient left the table.

In Cleveland, Ohio, all the cases that I saw were operated upon under nitrous oxid gas and oxygen alone. The anesthetic (given by Dr. Teter) was all that could be desired, the patient being completely anesthetized and all reflexes abolished. In order to maintain the anesthesia the gas and oxygen are forced through the nares under such pressure as to throw the blood from two to four feet. The surgeon in this instance seemed to be absolutely fearless to the possibilities of tuberculosis or syphilis, having only his glasses instead of some transparent shield to protect him.

In New York City, so far as I know, neither of these last two methods prevail. The usual procedure is to get the patient under narcosis with nitrous oxid gas or ethylchlorid followed by ether, using a closed method and getting the patient well under, and depending upon this first application of the anesthetic to complete the operation, or to reapply the anesthetic if necessary. In one clinic neither a local nor a general anesthetic is given the children. In St. Bartholomew's Clinic, with which I am connected, we use the nitrous oxid gas-ether sequence to get the patient under. The narcosis is maintained with ether vapor, supplemented by small amounts of chloroform vapor when necessary; all of the vapor passing

through a tube soldered to the mouth gag. A water suction pump is used to keep the throat clear of blood. This combination gives a continuous narcosis and a bloodless field.[18] All operators using this method find their time diminished one-third to one-half, enabling them to get their maximum speed without feeling hurried. Every surgeon who competes for time against the anesthetic as usually given, and hurries through the operation regardless of the blood obscuring his view, cannot do his best work and will sooner or later come to grief.

In all operations upon the upper air passages a preliminary douching with some antiseptic (in some instances to clear the parts of blood and pus) is absolutely essential. The principal duties of the anesthetist are to find out whether the breathing is nasal or oral, and to direct his anesthetic vapor accordingly; to keep a clear airway either by a suction pump or sponging; maintain an even narcosis; keep the mouth gag in position; protect the patient from too much weight upon the throat and chest either by artery forceps, or by an assistant leaning too heavily upon the chest, and assist the surgeon in any way that he may direct. This is possible by the anesthetist using a foot pump, thus leaving both hands free.

While I have purposely avoided going into detail regarding any given method, and have refrained from the positive advocacy of any special procedure, this much may be said in favor of pulmonary anesthetics in general: the narcosis is always under control and may be modified according to the exigencies of the case. In the event of hemorrhage or shock the quantity of the anesthetic may be lessened, and the oxygen increased, thus keeping the pulse and respiration as nearly normal as possible. As the operation is drawing to a close, the pulmonary anesthetic should be so gradually withdrawn that the patient will be practically out of its influence by the time the operation is completed. If preliminary medication has been given, as suggested in this paper, and the head of the operating table raised, and this position maintained by two pillows under the patient's head immediately after the patient being returned to bed, a twilight slumber will continue until the patient awakens in a quiet and natural manner.

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9. Small physiologic doses of morphin and atropin alone,

(Morphin, grains ⅙ to ¼,
Atropin, grs. 1-200 to 1-50),

Or combined with chlorotone,

(Fifteen grains of chlorotone and one-quarter of a grain of morphin, should be the maximum dose.)

Or this latter alone, when morphin is contraindicated; the usual dose of chlorotone is 10 to 20 grains. Five grains every fifteen minutes until the patient shows effects of the drug, the last dose to be taken thirty minutes before the operation.

If morphin is to be combined,it should be given with the last dose of chlorotone. Chlorotone is both a local anesthetic and a general hypnotic. Dr. Swepson Brooks of St. Vincent's Retreat has been using it for the past five years in 15-grain doses, and repeating in 30 minutes if necessary. He considers it safer than hyoscin.

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LXVII.

NASAL ACCESSORY SINUSES—DIFFERENT METHODS OF TREATMENT.*

By Lee M. Hurd, M. D.,

New York City.

It is well to look at the etiology and pathology of nasal sinus diseases before considering their treatment. The usual cause of sinus trouble is a deformed middle turbinate, with which is frequently associated a septal deviation to that side, an enlarged ethmoidal bulla, or the uncinate process may crowd in upon the nasofrontal duct. Superimposed upon these abnormal anatomic conditions are the changes due to infection of the nasal mucosa which turn the naturally open sinuses into closed infected cavities.

The cases should be divided into acute and chronic, mild and severe. At times what appears to be a mild case may be the most menacing to the individual.

It is also necessary to make sure whether one is dealing with a purely acute condition or an acute exacerbation of a chronic inflammation. An acute exacerbation is far more dangerous than a simple acute inflammation. In December, 1906, I saw a boy 16 years old, whose only history was recurring frontal headaches for several years, to which little attention had been given. For one week he had had a nasal cold. The day I first saw him he had a chill, followed by a temperature of 105° F., pulse 135, with much frontal pain and tenderness. Examination of the nose revealed inflamed membrane about the nasofrontal duct, with some pus. Transillumination showed right frontal sinus light, left dark, both antra light. By shrinking the tissues with cocain and saline douches the temperature dropped to 99.8° by the next morning, but again reached 105° at 3:30 p. m.; at 11:30 p. m. temperature still 105°. I then

*Read at the thirtieth Annual Meeting of the Ontario Medical Association, May 31, 1911.

removed part of the middle turbinate with considerable difficulty on account of a septal deviation, but could not get into the frontal sinus. However, I washed out a large ethmoidal cell and the temperature dropped to 103°, but the next morning it was climbing again--104°, continuing to 105°. I decided to open the sinus externally. He had a decided leucocytosis, 25,500, polymorphonuclears 81.6%. A Killian operation was done. The sinus was full of pus, under considerable pressure; the lining membrane was necrotic and easily lifted away from the bone. There was a large ethmoidal cell that occluded the nasofrontal duct, the same cell that I had washed out the night before and which had prevented my reaching the frontal sinus. It was three days before his temperature was normal. A case like this shows how suddenly a mild chronic affair can menace life.

The acute inflammations, without complications, will usually recover under simple medical measures, attention to the bowels, diet and nasal douches plus at times a slight intranasal operation.

The chronic inflammations will generally require surgical measures, intranasal usually, in a few cases a more radical external procedure.

The complications of sinus disease will require sound surgical judgment and should be met promptly. If there is any doubt about what can be done intranasally, go in from the outside, where the opportunity to see what you are doing is the best and the diseased tissue can be the more thoroughly cleaned out.

Nasal sinus disease, especially chronic cases, quite frequently involves several contiguous sinuses; generally the ethmoidals are the first involved, then extending to the frontal, antrum or sphenoid.

Orbital and ocular complications are the more frequent. Meningeal and cerebral complications take place more frequently than was formerly supposed. Gastric and intestinal derangement is quite often associated, from the swallowing of pus. Acute otitis and mastoiditis at times derive their infection from the nasal sinuses.

This priority of the ethmoidal infection leads me to think that these cells are not always given the attention their importance demands. They extend frequently out over the orbit,

where it is impossible to reach them through the anterior nares. In one case I found an anterior ethmoidal cell that extended fully an inch out over the orbit. This particular set of ethmoidal cells were accompanied by much frontal pain, tenderness and headaches with vertigo. There was a small amount of nasal purulent discharge. The eyes were normal. The middle turbinate and ethmoidal cells were removed as far as they could be seen, without relieving the symptoms. The external operation proved the frontal to be normal, but on reaching the ethmoidals this very large cell was discovered, which was filled with thickened membrane. All the ethmoidals and the anterior wall of the sphenoid sinus were removed. This resulted in the immediate relief of the headaches, and the vertigo disappeared in four weeks.

These cases that have the sinuses filled with very thick membrane are very obstinate to intranasal treatment. A case, to illustrate this condition, had ethmoid and frontal involvement. He had had recurrent nasal colds for over three years, with frontal and occipital headaches. The anterior end of the middle turbinate and some of the ethmoidal cells were removed two years before I saw him. He had gradually become worse, and was extremely nervous, feels mentally dull, lacks application, is easily fatigued and on the border of melancholia. The examination showed polypoid tissue about frontal duct with some pus. A probe could easily be passed into the frontal sinus, by which dead bone was detected on the posterior frontal wall at the frontal orifice of the duct. The X-ray showed a fairly large frontal sinus, which was very cloudy. A Killian was performed, but just before the operation, I, as I supposed, washed out the sinus through a canula, and to my surprise, when I removed the anterior frontal wall the pus and sinus membrane welled up into the wound under considerable pressure. When all the anterior wall was removed it was found that the canula had left a blood stained path through this thickened membrane, and the fluid from the douche had only followed the tract of the canula on its way out of the sinus and had not cleared out the pus or relieved the tension to any appreciable extent. This case shows how hopeless intranasal treatment is in this condition.

The antrum: acute inflammation. First determine the source of the infection, nasal or dental. The majority are

nasal, dating from an attack of influenza or nasal cold. The dental cases are far more apt to be of a chronic nature. Though the transilluminating lamp will help in the diagnosis, a good X-ray plate is of far greater value. Suction with Bier's apparatus sometimes brings pus from under the middle turbinate near the antral orifice, which is a fairly sure indication of antral disease, but an antral trocar passed through the nasoantral wall under the inferior turbinate is the surest way of arriving at the diagnosis.

The acute cases will frequently clear up with repeated douching through an antral trocar. With a little care the original hole made by the trocar can be found daily and the antrum washed out without discomfort to the patient. If the purulent matter does not diminish daily under this treatment, it is only a waste of time to continue. Then the antrum should be opened into the nose by removing the anterior third of the inferior turbinate and then removing all the nasoantral wall up to the attachment of the inferior turbinate. This wall can be easily removed by first puncturing it with Myles' antral chisel, then the opening enlarged with punch forceps and Wagener's antral forceps, until all the antral wall is removed beneath the inferior turbinate. This procedure will cure most cases of antral disease, where it is alone infected. Do not expect it to clear up with either the ethmoidals or the frontal sinus above infected. There are a few antra that will not get well by intranasal treatment. Then it is necessary to do an external operation through the canine fossa. The incision runs along the gingivolabial fold from the canine tooth to the last molar. After retracting the periosteum, the whole anterior antral wall is removed, giving especial care to the corners; then all the lining membrane is curetted out until it is a clean bony cavity; next the bony nasal wall is carefully removed from the nasal mucosa, saving all the membrane possible. The inferior turbinate bone is also shelled out; this makes its membrane available. This nasal mucosa is used to make two or three flaps that will cover to the best advantage the antral walls. One of the flaps should be attached anteriorly in such a manner that it can be wrapped around the anterior rim of the opening into the nose to prevent exuberant granulations in this locality. By this method the nasal mucosa lines a good share of the antral cavity, and as the antrum now is simply a

large recess of the nose, when healed, the patient can no longer suffer from antral disease, as this antral recess will hereafter be governed by the conditions of the nose alone. If the patient contracts a nasal cold the same condition pertains in the antral cavity, and when the cold clears up, the antrum does likewise.

The sphenoidal sinus, next to the antrum, gives the best results under intranasal treatment, though it is seldom alone infected. Most of the acute cases will recover under saline douches and injections of saturated argyrol solution into the sinus. If there is great pain, which is the case when the orifice closes, this pain being referred to the parietal, occipital or deep seated behind the eye, or there are ocular changes, free drainage must be immediately established. This can be done intranasally by removing part of the middle turbinate bone, resulting in a good view of the anterior sphenoidal wall. This wall can then be removed with biting forceps, which is as far as one should generally go, because the very thin walls of the sinus make it dangerous to use a curette. If it seems necessary to gain better drainage, use a dull forceps, grasping the thickened membrane and pulling it away carefully. It is only necessary to read one report of rupture of the cavernous sinus followed by death, from the use of the curette in the sphenoidal sinus, to approach this sinus ever after with the greatest caution. The sphenoidal sinus, in both acute and chronic conditions, is usually associated with a similar condition in the ethmoidal cells, especially the posterior group, and should be treated in conjunction with them.

The ethmoidal cells are probably the most frequently affected. The acute cases will usually recover under medical measures, though they may be very severe, as in influenza, with extension into the orbit, requiring immediate drainage, which is best done by the external route, where one can feel sure that it is all cleaned out.

This spring I saw a boy eight years old, who had had grippe three weeks before with some nasal symptoms. The day before I saw him his upper eyelid became edematous, with some frontal pain, much bone tenderness and considerable swelling and pus about the infundibulum. I opened the sinuses externally and found pus in the orbit just posterior to the lacrimal groove, where an anterior ethmoidal cell had ruptured. These

cells, also the frontal, were severely infected, with pus under some pressure. The frontal sinus at this age is small and can be easily cleared out from below without removing the anterior wall.

Chronic ethmoiditis will rarely get well without the removal of the diseased tissue. These cases run the gamut from very mild infection, in which is produced the edematous nasal polyp (which, by the way, is probably always due to sinus disease), to bone necrosis. The mild conditions can be cured intranasally; the more severe ones depend largely on their anatomic features whether they will clear up with intranasal treatment. Here the X-ray plate is of great service. If it shows the ethmoidal labyrinth to be compact, with no extensions over the orbit, one ought to be able to reach all the cells through the nose, but if there are extensions of the cells out over the orbit the chances of an intranasal cure are not very good. Sometimes these cells extend an inch externally. The frequent association of frontal and sphenoidal sinusitis must be taken into account in the treatment.

In removing the ethmoidal labyrinth intranasally the whole middle turbinate should be taken out, then the diseased ethmoidal tissue removed carefully. As soon as the operative field becomes obscured with blood one should cease until it is controlled or wait until another day to finish.

The frontal sinus usually becomes infected on account of some deformity about the nasofrontal duct; the middle turbinate, the ethmoidal bulla or the uncinate process crowds in upon the nasal orifice of this duct so that if the nasal mucosa swells, the duct soon becomes narrowed or completely closed, converting the frontal sinus into a closed infected cavity, causing pressure symptoms. This condition in acute cases can usually be relieved by nasal saline douches and shrinking the nasal membrane with cocain and weak suprarenal solution. If these medical measures do not suffice, the anterior end of the middle turbinate should be removed. Bier's suction apparatus will aid in withdrawing the secretion from the sinus.

There is one class of cases worth bringing to your attention. It is the supraorbital neuralgias due to changes in the sinus secretion in which a very thick mucus is produced. This neuralgia is of a periodic type, starting at a certain hour each day, continuing for a certain time, then suddenly stopping, the

patient feeling quite well the rest of the day. The period of the neuralgia is about the reverse to the usual frontal sinus pain, which starts as soon as the patient gets out of bed and lasts until the sinus has drained itself to some extent, which can be best illustrated by the following history: A man, 34 years old, of good habits, has had intense frontal neuralgia from 10 a. m. to 3 p. m. for two days. He gives a history of having a similar condition two years previously for six weeks, that came on at 10 a. m. and lasted a certain time each day; the pain was so intense that he became delirious. He was in a Mexican mining camp. At the time for the pain to come on he would lie down and endure it for several hours, becoming oblivious to his surroundings. It would stop at a certain hour, when he would proceed with his duties. On examination I found him extremely tender over the frontal sinus, the mucosa about the infundibulum was intensely congested, the least pressure in this region would increase the neuralgic pain. I observed this man go through his period of neuralgia for two days, and I do not remember seeing one suffer more intense pain. As I have said, it came on suddenly in an apparently healthy man, and he was completely incapacitated until the pain stopped, then he felt quite well again, considering the strain he had been through. I removed the anterior end of the middle turbinate and washed out a thick plug of mucus from the frontal sinus, when the neuralgia immediately disappeared not to return.

If there are orbital complications, such as edema of the lids, proptosis, etc., it is better judgment to open the sinus externally. I fully appreciate that some cases will be relieved by intranasal measures, but it is usually guesswork, and the infection may extend while you are temporizing. It might be well to add that orbital complications are comparatively rare.

The X-ray plate is of the greatest help in frontal sinusitis, especially in the treatment of the chronic conditions. Transillumination may be of some service, but should only be looked upon as one of the minor adjuncts for diagnosis.

In the chronic cases sometimes a clear history can be gotten where the condition started from an attack of influenza or a severe nasal cold; in others, no sudden onset can be traced.

The usual symptoms are bone tenderness, frontal pain, frontal headaches, indefinite sensations about the eye, vertigo and

a discharge of pus from the nose. Purulent nasal discharge and tenderness are the two most frequent symptoms of which the patient complains.

The object sought is to establish drainage. This may be effected by simply removing the anterior end of the middle turbinate. It may also be necessary to take down some of the uncinate process and remove the anterior ethmoidal cells. Here the X-ray plate is of great service in determining how much can be done intranasally toward enlarging the nasofrontal duct. Where the plates show sufficient room between the nasal septum and the inner angle of the eye, and the side view shows a deep sinus, it is justifiable to enlarge the duct intranasally at the expense of its anterior and external walls. This should be done with great caution, using instruments that cut away from the brain. It is also well to leave some of the mucous membrane lining of the duct to prevent stricture later.

Mild cases can be irrigated with astringent solutions. Probably the best is zinc sulphocarbolate, as strong as the patient will tolerate, starting with twenty grains to the ounce; injections of saturated argyrol, freshly made, or silver nitrate from one per cent to saturated solution. I use the strong silver nitrate solution in old chronic cases where there is a moderate thickening of the membrane. Remembering that some individuals do not tolerate these strong solutions, I start with weaker ones and work up to 480 grains to the ounce. The sinus is first washed as clean as possible, then 10% solution of cocain is injected into the sinus, and when it is anesthetized inject the strong silver solution, flooding the nose at the same time with a solution of sodium chlorid so that as soon as the silver nitrate emerges from the sinus it is turned into sodium nitrate, which has no effect upon the nasal membrane. This method has given me some permanent results.

In cases where the discharge is more mucoid than purulent Beck's paste will give good results. It should be injected solid with the idea of filling the sinus cavity and creating some pressure on the thickened membrane, and the bismuth subnitrate acts as an antiseptic.

Bier's method of producing hyperemia by suction has much in its favor in conjunction with the above methods.

It is often asked: What proportion of sinus disease is amenable to these intranasal methods? From my experience,

between 90 and 95 per cent can be relieved or cured. Shall we try intranasal treatment in all cases first? No. There are some cases in which it is very doubtful or hopeless to expect any results through the nose. Cases in which there are great pain and severe headaches, impaired health, neurosis, a productive inflammation in which the tissue is much firmer and more vascular than the ordinary polypoid tissue, orbital, ocular and cerebral complications, and some few patients that have not the time to spend trying the more conservative methods.

The external route holds many advantages and some disadvantages. Among the advantages are that one can directly see the anatomic and pathologic conditions and should be able to clear out all of the diseased tissue except in the sphenoid sinus. The cure is shortened from weeks to days and a recovery obtained in a larger proportion of the cases. Among the disadvantages are it submits your patient to the risk of a major opertion. (For instance, I had one patient die of ether pneumonia. This case showed at autopsy that the external and posterior bony walls of the sphenoidal sinus were softened and the dura adherent to them. What would have happened if the man had not died of pneumonia is impossible to say, but the operation should have been done months before.) There is likewise danger of diplopia and meningitis, also osteomyelitis. The last two I have never seen, though they are so formidable that their possibility should always be borne in mind. Diplopia means poor technic or carelessness. Deformity is due to the same causes as diplopia, except the cupping of the forehead from removal of the anterior frontal wall. This can be corrected with paraffin injection if the patient wishes, but I have yet to have a patient seriously object to this depression.

The Killian operation is the best suited and gives the best results as to cure of any operation devised to date. The two reasons for an external operation are best met by this method; that is, ability to see everywhere, especially where it is necessary to enter the ethmoidals and the sphenoidal sinus, and also to give the greatest amount of drainage into the nose with the least amount of disfigurement. Recently there has been some discussion about leaving the anterior frontal wall to prevent deformity. I am not ready to admit this is a good procedure, because if a small amount of mucous membrane is

left in some pocket of the sinus, it will act as a cyst or point of infection. The safest way is to remove the anterior wall in the large sinuses; in the small ones it does not make any difference, as there will be little deformity, and if the anterior wall has been removed, you are absolutely sure the sinus is clean. Theoretically, there may be more danger in removing the anterior from osteomyelitis, but that is a point with which I have had no experience and I hope something practical may be brought out in the discussion.

A perfect cosmetic result can be obtained by attention to the minor details, such as crossmarking the line of incision before making the cut; then be careful and injure the orbicularis muscle as little as possible, never disturbing the periosteum over the arch of bone; do not mangle the edges of the wound in elevating the periosteum, and lastly, whether you use sutures or metal clips, take them off inside of twenty-four hours, and you will have a result of which you will not be ashamed.

15 East 48th Street.

LXVIII.

TREATMENT OF THE MASTOID WOUND FOLLOWING OPERATION.*

By H. Beattie Brown, M. D.,

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The basis of the paper herewith presented consists of a series of two hundred cases which have come under my care at the Manhattan Eye, Ear and Throat Hospital and the New York Postgraduate Medical School and Hospital during the past five years.

The treatment of the wound following the mastoid operation does not seem to have received as large a share of consideration, at the hands of many writers on the subject of mastoid surgery, as it deserves, but has too often been considered as a routine matter, to be attended to by anyone who can pack gauze into a cavity.

Five principal methods are employed for dealing with the posterior incision.

First. Closure of the wound at the upper and lower extremity of the incision, leaving the central portion open for dressing.

Second. Leaving the wound open to allow granulation tissue to fill in the entire area.

Third. Suturing the flaps together throughout the length of the incision and trusting that nature will complete the healing satisfactorily by formation of a blood clot.

Fourth. Suturing the wound at its upper portion only.

Fifth. Closure of the wound, leaving drain in the lower portion.

While each of these methods has its advocates, the writer prefers the fourth method, which appears to him the most

*Candidate's thesis presented for the American Laryngological, Rhinological and Otological Society, June, 1911.

natural way: first, because the surgeon closes just so much of the wound as the case seems to require, leaving the lower portion of the wound open for dressing and drainage; and second, no pocket is left that might retain secretion, at the lower angle, and become a source of infection of the wound.

Whichever method is adopted, the wound is finally bandaged and the patient returned to bed to await the aftertreatment.

As much care should be exercised in having the dressings of the mastoid wound performed under antiseptic conditions as is used when performing the primary operation. It is therefore necessary that the surgeon have his hands and instruments sterilized when accomplishing this work. Indeed, if it were ever justifiable to be more careful in one case than in another, the performance of the dressing would call for the greater care, so far as asepsis is concerned, for before the operation is performed one has to deal with an area that is already infected and more or less occupied by pus; while at the time of dressing, one expects and ought to have a cavity free from infection, with healthy granulations endeavoring to establish themselves, that ought not to be infected by dirty hands or instruments.

Modifications of Technic.—The modification of technic in treatment of the mastoid wound has been very great. It is not a long time ago when at every dressing of the wound it was considered necessary to wash out the cavity thoroughly, and for this purpose the surgeon would take a large quantity, varying from a half pint to a quart, of solution of bichlorid of mercury, carbolic acid solution of varying strength, formalin solution, boiled water or normal saline, and with a syringe proceed to flush out every nook and crevice of the area that was struggling to put out new granulations, and after washing away all that he could of the healing covering that nature had thrown over the denuded area, he would proceed to fill the cavity with gauze of the strongest percentage of iodoform obtainable, and this method would be continued until dressings were no longer necessary, leaving a deep depression or ugly scar in nearly every case.

In this connection I quote from one of the leaders in mastoid surgery of the period just referred to: "Dust the cavity with iodoform, then fill the cavity with iodoform gauze, and

cover the whole with a cushion of the same gauze and then put on the bandage. Remove the dressing on the day following the operation and give the excavation a thorough washing with warm bichlorid solution, and then lay a cushion of iodoform gauze over the region of the wound. Change the dressing and employ bichlorid injections either once or twice a day. I prefer twice daily until the fourth or fifth day; after this I make no further attempts to reach the antrum with the stream of bichlorid solution."

Only after dressing a series of cases using the old technic, and treating another series according to the more modern method—that may be styled the dry method—could the conclusion be reached that under the present dry method the new granulations are healthier and more firm, the wound heals more quickly and the minimum of scar results.

An Average Normal Case.—No exceptional change of temperature having occurred, the patient having good sleep at night, taking nourishment as he ought; only as moderate a degree of pain as might be expected; the original dressing is not disturbed before the fourth day, or frequently not until the fifth day following the operation, unless the operator has at his first dressing used rubber tissue as a lining membrane in the cavity for containing the gauze dressing, with the idea of making the first change of dressing more comfortable for his patient, in which case the whole dressing would be changed at the end of twenty-four or thirty hours.

We do not advocate the use of rubber tissue, believing that the simple fact of changing the dressing so soon after the operation is more annoying to the patient than the pain inflicted by removing the gauze, which by the fifth day is saturated with secretions and loosened from the walls of the wound sufficiently to prevent severe suffering.

First Change of Dressing.—On the fourth or fifth day the first change of dressing is made. After removing the outer covering, and before removing the gauze from the wound, the surrounding area should be thoroughly cleansed. This may be done in most cases by using a sponge of cotton moistened in sterile water. Sometimes when secretions adhere to the surrounding skin, peroxid of hydrogen may be used.

When the secretions become hard and form crusts on the surrounding surface, the above agents will not remove them

without too much rubbing and irritation of the tissues. In such cases I know of nothing that acts so quickly and satisfactorily as spirits of turpentine, followed by alcohol.

How to Dress Wound.—The surrounding area thus cleansed, the gauze is withdrawn, the wound is gently mopped with sterile cotton on an applicator (the cotton soaked in 1-500 bichlorid, with the excess of bichlorid squeezed out), the new gauze inserted, and after this is done the sutures are removed. In a normal case when the gauze is first withdrawn, the wound appears comparatively dry, with its surface covered with a uniform layer of red granulations.

When the first dressing is inserted into the wound the operator presses it in with considerable firmness, to aid in preventing too much hemorrhage, as well as for drainage. Now that danger has passed, and we desire the new granulations to flourish, though not to be too prolific, hence the second dressing should be placed in the wound with only moderate firmness, and thus by the degree of pressure made by the gauze, regulate the prosperity of the new granulation tissue.

The subsequent dressings in a normal case should be changed every second day until the cavity becomes well filled in with new tissue, when the interval between the dressings may be lengthened, and now instead of continuing to fill the wound with gauze, pure boric acid is used, the cavity being filled with it, and covered by a light, superficial antiseptic dressing of plain gauze. This acid acts not only as an antiseptic dressing, but is an ideal drain.

The two conditions that would call for a change of dressing, different from that indicated, are: Pain, due to pressure or infected sutures, or cellulitis; and secondly, temperature. There is usually a rise in temperature twenty-four hours following a mastoid operation, but where there is a sudden rise to 103° or higher, with an abrupt fall to 98° within a few hours, and this change is repeated two or three times a day, infection of adjacent structures must be suspected and the wound examined.

Even though the case has been a normal one as regards the formation of the new granulation tissue, there is always a liability of a depression being left in the surface after healing is complete, due to the fact that when the mastoid cells

have been removed there is no support left for holding the flaps up in position. The anterior flap, particularly, has a tendency to fall in against the posterior canal wall, and cicatricial tissue forming between this wall and the base of the anterior flap, draws the flap still more forcibly inward and forward, and with the new growth of epithelium, which begins at the skin edge of the flap, this surface (i. e., the anterior surface of the wound) soon becomes covered with epithelium and a great depression is the result. Such a misfortune may very often be prevented if at the first few dressings the surgeon adjusts the gauze so that the flap is pushed outward and up from the wound, thus preventing the raw surfaces from approaching each other; in fact, the gauze should be inserted in the entire wound in such a manner as to push both flaps outward and thus cause the edges of the flaps to remain separated. This will reduce the amount of depression left, and prevent the edges of the flaps from turning in toward the wound. This part of the dressing requires a great deal of care, otherwise the flaps being brought outward by insertion of too much gauze, will cause a gaping wound with the auricle extending out from the side of the head at almost a right angle.

If, when the first dressing is changed, and the drain is withdrawn from the external auditory canal, there is a discharge from the middle ear, this discharge should be cleaned away and the canal thoroughly cleansed by using a pledget of dry, sterile cotton on an applicator, and then after dusting the surface lightly with powdered boric acid, a strip of plain sterile gauze should be inserted, extending to the bottom of the canal, and so repeated with each dressing of the case until no more discharge is present.

There is a second reason, also, for inserting the gauze into the external auditory canal. Even though at the time of operation the posterior canal wall is not necrotic and none, or a very small part of it, is removed, there exists a tendency for the anterior flap, which forms a part of the posterior canal wall, to fall forward and carry with it the cartilaginous portion of the posterior wall of the external auditory canal, but where a portion of the bony posterior wall is necrotic, or has been removed en masse at the time of operation, the liability of this anterior displacement of the flap is very much greater,

with the added calamity that a partial or complete atresia of the external auditory canal may follow. Therefore, in placing the gauze in the mastoid wound, the surgeon should be careful to not use so much pressure as to push the posterior cartilaginous wall forward, and in order to prevent whatever forward displacement might occur, a strip of gauze should be placed rather firmly in the auditory canal to thus preserve its normal caliber, as well as to act as a drain.

While the first object desired by inserting the gauze into the mastoid wound is to secure good drainage, the second, and almost equally important reason is, that the edges of the skin flaps may be held up and thus prevent a sulcus, and save the auditory canal from atresia. The books say the skin flaps should be kept widely separated, but this is not enough. If simply kept separated they will eventually turn in and thus increase the depth of the permanent depression. They should be kept separated, not by the gauze being placed between their edges from without, but by having the gauze so adjusted beneath them (i. e., from within) that it will push the flaps outward and upward, and thus separate their edges. Additional gauze will then be lightly placed over the entire wound as protection from infection and to complete the drainage, and not for the purpose of separation.

Obstacles to Healing.—In the process of healing every case does not run what we term a normal course. Certain obstacles to healing arise which cause the surgeon thought and worry. These may be enumerated as follows:

First. Delegating the work to an assistant.
Second. Infected sutures.
Third. Failure to include the periosteum in the suture.
Fourth. Failure to eradicate all diseased bone.
Fifth. A sinus.
Sixth. Removal of too much bone.
Seventh. Shock and low vitality.
Eighth. Adenoids and hypertrophied tonsils.
Ninth. Unhealthy granulation tissue.
Tenth. Cellulitis.
Eleventh. Anemia.
Twelfth. Diabetes.

Time and your patience will not allow speaking at length of all these obstacles to healing, though I assure you not

enough attention is given to some of those conditions which, though seemingly insignificant, are of great importance.

After operating, it is so convenient for the surgeon to turn the case over to one of the internes for aftertreatment, and this course, which is too often followed, I believe is a mistake and often leads to a poor result.

Every young doctor who secures appointment on a hospital staff has not had opportunities for following up any cases similar to those which now come under his attention, and cannot reasonably be expected to know the best methods to pursue in caring for this class of cases. Other men, who pass good examinations and secure appointments, have not sufficient knowledge of aural surgery, and often lack practicability. The propriety, therefore, of delegating to an assistant the treatment following the mastoid operation, depends whether the assistant belongs to either of the classes just mentioned, or whether he is one of those well posted, practical men who has had enough experience to make him safe, and possesses sufficient good judgment to cause him to dress each case according to its particular requirements, for no two cases are alike.

Second. Failure to eradicate all diseased bone is an important obstacle, for not only does an area of necrosis that has been left prevent healing, but it almost invariably leads to the formation of the third obstacle, of which I will speak, namely, a sinus.

A sinus may persist passing through the aditus. This may be caused (a) by necrotic bone or tissue having been left in the aditus, or at the meeting of its posterior margin with the antrum. In every case the gauze used for dressing should be first made to enter this space, for unless this part is kept open and thoroughly drained until diseased products have all escaped and new granulations have filled in the passage from the anturm to the middle ear, a sinus is inevitable, which will give trouble in healing later, or may make a secondary operation necessary. It is important, therefore, that the gauze be inserted into the antral opening of the aditus, and as granulations spring up in this situation, filling in the cavity, the depth to which the gauze is carried becomes less and less at each succeeding dressing.

Such a sinus may be caused (b) by delayed resolution in

the middle ear, because the operation has been too long delayed, thus permitting necrosis to extend to the structures of the tympanum, destroying the soft parts contained in the cavity and involving the incus in particular, though the whole chain of ossicles may be included in the process of destruction.

Where such a condition presents, though the posterior wound may apparently heal kindly, it will be only a short time ere the discharge again becomes free from the middle ear, through the external auditory canal, or the pus may make its way backward into the newly formed tissue and cause a breaking down of the entire area which had apparently healed, or it may burrow a sinus through the new tissue, opening itself in the post aural line of incision.

Treatment.—In this class of cases one may enlarge the opening of the sinus, and by a patient use of stimulating antiseptics (strong bichlorid, 1-500 on an applicator; nitrate of silver, 40 to 60 grains to the ounce, or a solution of formalin), both in the middle ear and in the sinus itself, together with careful drainage by gauze or boric acid powder in the sinus, secure a final, healthful closure of the wound in some cases. Where this result does not obtain in a reasonable time (one month), a cure can be effected only by performing a secondary operation; or it may be that a radical operation will be required.

Such a sinus may be produced by other causes. (c) There are three groups of cells which may be the source of this troublesome condition.

First. A group of cells occupying the posterior or middle zygomatic root, extending even into a portion of the temporal ridge, which, when present, are nearly always more or less involved in the necrotic process. These cells may be very extensive, and though much care may be required to secure their complete removal, lest the dura be injured or opened to infection by breaking into the middle fossa, unless their extinction be complete, a sinus with delayed healing is almost inevitable.

Second. That group of medullary spaces posterior to the sigmoid sinus, which may be easily passed by unobserved unless the operator is systematic in his operative technic, for oftentimes the cortex overlaying them is firm and of good

color, yet the underlying cells share in the infective process and must necessarily be obliterated in order to be sure that no sinus, with subsequent infection, takes its source from that area.

Third. The lower part of the mastoid process, under the name of the "tip of the mastoid," where one large cell may exist or several smaller ones lie, and which almost invariably contains a good quantity of pus, the presence of which will certainly guarantee a sinus unless their complete removal is accomplished.

Treatment.—A sinus having its source in either of the areas just specified is due to dead bone, and will not be cured except by a thorough curetting. This should not be attempted by the use of cocain, for the pain is too great to allow the area to be curetted as thoroughly as it should be to warrant a cure. The patient should be anesthetized, and the operation conducted under thorough antiseptic conditions. The writer has a case under treatment at the time of this writing, who, after having the mastoid operation performed elsewhere, thought it did not heal quickly enough (eight weeks after operation) and made his way to the hospital. Examination of the wound showed a sinus one-eighth of an inch in diameter, leading from the antrum to the middle ear, filled with unhealthy granulations and a goodly amount of creamy pus.

The probe showed that the pus was coming from the cells in the posterior root of the zygoma, and the patient was advised to have this area curetted. He went back to the surgeon who performed the original operation, who did curette the part, but he attempted to do the operation under cocain, with the result that the operation was very incomplete on account of pain, and the patient made his way to the hospital again, where I found the pus manufactory "still doing business at the old stand."

These sinuses will not close until all of the necrotic bone is removed, and until this is done there is the constant danger to the patient of having the process of necrosis extend to the brain, or infect the tissues of the neck. After a thorough curettement has been done under anesthesia the treatment of the wound is the same as already specified for the original mastoid wound.

It sometimes happens that a sinus is formed because of

what seems to be a development of unhealthful granulation tissue, and in which no area of dead bone can be detected. In such cases, which are few, a curettement followed by the use of one of the many antiseptic stimulating agents, $AgNO_3$, $CuSO_4$, or a solution of formalin poured into the unhealed tract, which is then completely filled with powdered boric acid, will quickly cause its closure, provided no dead bone is hidden somewhere beneath.

During the past year I have treated eight such cases, in four of which, when the stimulating fluid was poured into the sinus, behind the auricle, it ran through the middle ear and out of the external auditory meatus, and in one case the membrana tympani being intact, the solution entered the mouth through the eustachian tube.

Every one of these cases eventually healed completely, and when the external opening closed the whole tissue was firm and healthful.

Fourth Obstacle.—The removal of too much bone is a cause of delayed healing. The elements for the nutrition and repair of the bone exist in the nerves, lymphatics, arteries, veins and osteoblasts contained in the endosteum, and by so much as these elements are destroyed or removed, by so much is the repair delayed, impoverished or prevented.

The removal of too much bone is, therefore, a cause of slow healing and increases the liability of infection in the wound, and it ought always to be remembered that a poor supply of the elements named, not only reduces nutrition of the part, but invites the advance of bacterial growth and the delayed formation of granulation tissue. There is no advantage in securing a perfectly smooth surface so far as the process of repair is concerned, and it is well to remember that by the time so much bony structure has been removed as to leave a uniformly smooth surface, one has approached very near the dura, and thus in making a nice appearing wound, all smooth and shiny, the close approach to the dura has increased the liability to infection of the brain through the thin plate of bone that has been left, and has greatly reduced the power of repair in the bone, and by thus reducing the vitality of the bone, the power to form new granulation tissue is reduced, and frequently minute pieces of bone (sequestra) are thrown off and will be found in the dressing.

In fact, where it becomes necessary to remove so much of the bony structure as to leave merely a film of bone covering the dura, either over the sinus or over the middle fossa or cerebellum, I believe it hastens the growth of granulation tissue and causes the wound to heal more rapidly, to remove the bone entirely and allow the dura to be exposed, for it appears that when the bony structure covering the dura has been taken away until only a very thin layer of osseous tissue remains, the elements of nutrition have been so far destroyed that, though the bone survives, there is not enough circulation in the bone to produce granulation tissue, and thus healing is delayed and a sinus is sometimes formed in that way.

Fifth Obstacle.—Shock and low vitality. Some authors would lead one to believe that there is either no shock, or if any very little, to the person who undergoes a mastoid operation. I believe such an opinion is erroneous, and that shock following this operation is, in some cases, very great, while in others it is less, but in every case it is considerable.

The causes that have led up to the necessity for operation have been a more or less prolonged cause of lowering the vitality of the patient, as well as producing a complete loss of vitality in a large part of the mastoid bone.

This loss of vitality or diminution of the power of resistance renders shock to the patient more severe, and is an important obstacle to the process of repair.

The etiology of surgical shock has not been satisfactorily determined, but we know that the condition of the system prior to operation has a determining influence upon the character of the shock sustained.

In mastoid surgery, not often would shock occur from loss of blood, but vasomotor depression or nerve exhaustion may readily occur, and in the opinion of the writer does take place to a greater or less degree in every case.

The lowered vitality of the patient who suffers from a severe aural lesion is a factor in establishing a mastoiditis, and this condition, increased by operation, loss of blood and shock, is a great obstacle to satisfactory and prompt healing of the wound.

There can be no question that the reason for one case healing more quickly than another is due to difference in the

tissues of different individuals, and that difference consists in the fact that one patient has more power of resistance than another, or more vitality, more life producing energy. It therefore is a most important matter that the condition of the system of the patient be looked after in an attempt to secure the best and most rapid result.

Tissues with low vascularity are notoriously slow in healing. The surgeon would therefore note whether the patient possesses the

Sixth Obstacle, Anemia.—Anemia as a systemic condition, or local anemia of the tissues surrounding the wound, caused by pressure from too tight bandaging.

If of the latter variety it is easily overcome by attention to the dressing, and seeing that the bandage is not applied with too much tension.

If the anemia is systemic, proper remedies and tonics should be at once brought into use.

In any attempt to secure a good result after operation, the resistance of the tissue of the individual must be considered. This resistance is due to several causes.

The blood serum is directly destructive to a number of organisms, and there is no doubt that the leucocytes play a most important part in destroying the bacteria, in preventing their absorption and in warding off their action from the surrounding tissue cells. Different patients have different degrees of susceptibility to the action of bacteria, and this is largely due to the difference in the destructive powers of their serum.

This constitutes the power of resistance, of which the anemic patient, and the run down patient, have but little, thus making the tonic treatment necessary.

The kind of food used by these patients is important in increasing the recuperative function. Private patients are usually able to get good, wholesome and digestible articles of diet, though they often do not live up to their ability in this particular and need advice most emphatically, while the average hospital patient, during most of his life at least, has been living on poor food, thus producing a body of low resistance, and in this class of patients it is a matter of the utmost importance to have them provided with food most nourishing, and that may be easily assimilated. In iron,

arsenic and strychnin we have a combination of standard value.

For an immediate effect upon the anemia, I believe we have a most efficient remedy in nytroglycerin, gr. 1-200 four times a day to an average adult. For children, syr. of the chlorid of iron is palatable and very satisfactory.

Every aurist is familiar with the fact that aural inflammation is frequently caused by adenoid tissue in the nasopharynx and by diseased tonsils.

The same causes act in a similar manner to prevent healing, after the mastoid operation, and are too well understood to require repetition at this time. Masses of adenoid tissue and enlarged or diseased tonsils, as well as adhesions in the fossa of Rosenmüller, should be removed.

The part played in the act of healing by diabetes is too large to be considered properly in the limit of this paper, and should be carefully considered by the surgeon who undertakes the work of mastoid surgery, by familiarizing himself with the conditions produced in the system by this disease, and which have a marked influence upon the prognosis.

As in a person suffering from general anemia, any inflammatory condition will run a more severe course, so also in a diabetic subject an inflammation is more severe, and tends to assume a necrotic character and make the prognosis more grave. It is probable that in diabetes the germicidal power of the blood serum is greatly diminished, while sugar in the tissues is peculiarly stimulating to the growth of microorganisms; consequently, the poorly nourished and nonresisting tissues of a diabetic are unusually susceptible to microbe infiltration, and thus this disease becomes a weighty obstacle to the healing of the wound, and energetic treatment of the disease should be instituted at once.

Treatment.—The treatment of diabetes is too large a subject to be discussed here. Suffice it to say that the diet should of course be regulated as regards carbohydrates and fats. Food should not be withheld too strictly, as starvation favors the formation of poisonous acids. Excessive purgation should be avoided. Sodium bicarb. should be given in large doses (50 to 150 grams) until the urine becomes alkaline.

For the regular course of treatment the attendant should consult a good text book on this subject.

It remains to speak of the different varieties of granulation tissue that form to fill in the cavity of the mastoid wound.

Looking into a healthy wound one sees small, reddish elevations, usually covering a large part of the entire surface by the fourth or fifth day. The red color of these granulations is due to their great vascularity, and the presence in each granulation of a collection of newly formed capillaries, with more or less connective tissue, produces the irregularity of the whole surface.

Such granulation tissue exudes a serous fluid from its surface, consisting of serum, fibrin, leucocytes and red cells. Smooth, compact, reddish granulations are designated as "healthy" granulations.

In persons whose resistance is diminished by illness or other causes, the granulations may assume another type. In some cases the surface is very irregular, and the projections are soft and bleed upon the slightest touch, and are exceedingly sensitive.

To this form of granulation tissue the name "irritable" has been given, and as a rule it does not lead to prompt healing, but necessitates active treatment in order to secure a growth of normal type.

Treatment.—This form of granulation tissue should be curetted away and the cavity filled with iodoform gauze, inserted with a considerable degree of pressure, until the granulations take on a healthy growth.

Another form of granulation tissue differing from the normal, healthy type, is known as "exuberant" granulation tissue.

It is not reddish in color, but pale, soft and spongy, and shows an irregular surface with no firmness. The surface is covered with a yellowish, fibrinopurulent exudate, through which little reddish points project themselves, due to greater vascularity than the rest of the surrounding tissues.

This variety needs to be removed with a curette, after which the surface is painted with nitrate of silver, 360 grains to the ounce, and the wound then filled with plain sterile gauze, inserted with much pressure.

It will sometimes be found that the wound cavity fills in nicely with new tissue, and then at a certain stage, just before dermatization takes place, the granulations cease to grow

and the exuberant type of granulation tissue begins to assert itself.

While nitrate of silver, either pure, as by the pencil, or in solution of 480 grains to the ounce of water, will reduce these granulations, it also produces a considerable amount of discharge and makes a sloughing surface. In these cases I have had excellent results by the application of Monsel's solution (liq. ferri subsulphatis).

Tubercular granulation tissue is pale, flabby and of the exuberant type, and when examined microscopically shows the characteristic lesions incited by the tubercle bacillus.

The regulation of pressure has little effect upon this variety. In one case, after the writer had failed to cause the wound to heal by the use of almost every known remedy, the granulations took on a healthy form and the wound closed very rapidly under dressing with gauze saturated with Koch's lymph. The more recent tuberculin has not proved of any special benefit in this class of cases. It is needless to add that patients of this kind require the best possible antitubercular treatment for their general condition.

In the syphilitic variety of granulation tissue we see a type that closely resembles normal healthy granulations, though of a slightly paler color and more flabby.

The microscope will show the characteristic lesions of the disease, viz.: areas of necrosis with a few giant cells scattered through the tissues; swelling of the endothelium of the capillaries, with a perivascular infiltration of the leucocytes, usually mononuclear in type.

Where this disease is suspected (and it ought always to be kept in mind) the patient should at once be put on antisyphilitic treatment.

From what has been said it will appear that the postoperative treatment of the mastoid wound is more than packing a cavity with gauze; that it requires a study of the case and good judgment as well as skillful care.

The time required for the wound to heal in a patient who, apart from the mastoid involvement is in good health, is about six weeks. Variations from this are usually caused by one or more of the foregoing obstacles to healing, and if these obstacles are prevented in the beginning, there will not be a very large number of cases that have a protracted period of convalescence.

Exceptions to this statement will be found among hospital clinic cases. Here we must labor at a disadvantage. A large percentage of the socalled clinic cases come from vile surroundings, having few, if any, of the ordinary comforts of life and living. Many of their houses are filthy, certainly very few know anything about surgical cleanliness, and a great number of them are poorly fed and have very low bodily resistance. We naturally expect such cases to require a much longer time to recover, and we are not often disappointed in this expectation. Eight weeks being a fair average, though in a certain number twelve weeks are required, due, undoubtedly, to the above causes.

The tubercular and syphilitic cases, and those in which streptococci are found in the blood, are the slowest in healing. I have the record of one case in which streptococci were abundant in the blood, and in which five months were necessary to produce a cure; while on the other hand there have been many cases in young, well nourished children, whose power of resistance was so good that they have secured a perfect cure in four weeks.

But the successful aftertreatment of the mastoid wound requires of the attendant more than the actual dressing of the wound and the prevention and overcoming of obstacles. He must be ever on the watch for any complications that may arise, principal among which may be mentioned extension of infection to the brain structures and meningitis, and thrombosis of the sigmoid sinus or internal jugular vein.

In this paper one cannot discuss these conditions, though it may not be out of place to say that where the temperature chart shows a sudden rise to 103° or more, with an equally abrupt fall to 98° or thereabouts, within a few hours, and this sudden variation repeats itself a number of times within twenty-four to thirty-six hours, a thrombus may be expected, and no time should be lost in investigating its cause.

If the meninges are involved, in addition to high temperature, 105°-106°, there will be headache, usually limited to one side of the head, which may at first be referred by the patient only to the region around the affected ear.

This pain usually, however, soon spreads over the whole head and keeps the patient in constant agony.

Photophobia is present in a majority of cases. The patient

seeks a quiet place and moans or cries out when the pain is most severe.

In children delirium is not uncommon, and shrieking cries with an attempt to apparently exclaim something is common.

The neck muscles become rigid, the head is drawn backward and any motion or attempt to straighten the head on the neck is painful. In extreme cases opisthotonos is present, vomiting usual.

In many cases there is a choked disk, though there is much difference of opinion among different observers regarding this symptom, which depends on the location and extent of the lesion.

A blood count should always be made if any doubt still exists as to the presence of meningitis. Some of the spinal fluid (10-15 cc.) should be withdrawn and examined. If an amount of albumin exceeding 1 per cent is found, there is every reason to believe meningitis present, and the presence of pus and an increase of polymorphonuclear cells make the diagnosis positive. A blood culture, here, may be of the utmost advantage.

While the large majority of cases result in complete healing of the wound when the postoperative treatment is properly executed, following a complete operation, there remains a certain number of cases in which suppuration continues. Results already obtained by the use of autogenous vaccines and the Hiss extract of leucocytes, in cases where a suppurative process still persists, warrant their continued use and offer a broad field for conscientious, scientific work. For successful results in the use of vaccines it is necessary to isolate the causal organism, which is exceedingly difficult because most of the smears show mixed infection. Where the isolation can be effected the vaccine may be considered a specific. It is obvious that work along this line must be accomplished through the aid of a conscientious laboratory worker, and where so done the results are very satisfactory.

While the effect of the Hiss extract in the system is produced through an altogether different mode of action from the vaccines, its results in properly selected cases are almost marvelous. I cannot now enter into a discussion of these agents or their physiologic workings. I desire only to hold out some hope to those sufferers from chronic ear suppura-

tion, who, unless properly advised, are doomed to spend their remaining years nursing a continuously discharging ear, which might have been cured.

In what has been said no reference has been made to the socalled radical operation. It remains, therefore, to consider the aftertreatment of this condition.

There seems to be some confusion as regards the names of these operations. While we would not detract from the honor of one who has given an advanced method to the profession, it appears to the writer that a better nomenclature has been adopted by some than that of calling an operation after the name of the surgeon who first proposes it.

The operation which exenterates the entire mastoid process has always been called the Schwartze operation. Similarly, the operation which removes the posterior canal wall and eradicates all disease from the antrum, aditus and middle ear has been designated as the Stacke operation; while that operation which removes all of the mastoid process, together with the posterior canal wall and the diseased tissue from the middle ear, is known as the Schwartze-Stacke operation.

While the Stacke operation is a radical operation, and in many of the text books is referred to as the radical operation, the true radical operation is the combined operation of Schwartze and Stacke, otherwise known as the Schwartze-Stacke operation.

It appears to the writer that all this confusion would be avoided if, instead of naming the operation after its originator, it were named with relation to the anatomic area in which it is performed. Thus: when the simple operation of removing all of the mastoid tissue is performed, it is called the mastoid operation. When the socalled radical operation is performed, which is done for the purpose of converting the antrum, aditus and middle ear into one cavity, it be called the antrotympanic operation; and when the combined operation of removing all of the mastoid bone, together with the posterior wall and the diseased contents of the middle ear is done, it be called the mastotympanic operation.

Under this method it would seem as though no confusion of names would exist.

In the treatment then of the wound after the mastotympanic or radical operation, one has to deal with a cavity that has to

be drained and dressed through the external auditory canal. The posterior wound has been entirely closed; the cavity has been filled with iodoform gauze and the ordinary external dressing applied. This dressing is not changed until the third day, at which time the sutures of the posterior wound should be inspected, and if any inflammatory condition is present at the site of any suture, that suture should be removed at once. The gauze is withdrawn from the canal, care being taken not to disturb the flaps, which at this time are scarcely adherent to the bony wall of the wound. The cavity is now mopped out with dry sterile cotton, and is again filled with plain sterile gauze. On the fifth day this dressing is changed, the posterior wound should be entirely healed and the sutures removed; the gauze is withdrawn from the cavity through the external canal and now granulation tissue will be seen springing up over the wall of the cavity. Boric acid is now dusted over the entire area, and a pledget of sterile cotton formed into the shape of a cone is inserted through the external auditory canal, reaching to the bottom of the wound. From this time on the cavity should be gently mopped out with dry sterile cotton three times a day and the cone shaped piece of cotton inserted after each cleansing. The entire wound will be healed in from four to six weeks.

We regret that every case does not follow this ideal course. There are four areas which if not thoroughly curetted of all diseased tissue will prevent the wound from healing, and may make a secondary operation necessary. These are the cells of the posterior zygomatic root, the tympanic orifice of the eustachian tube, the attic, and that portion of the tympanum which is formed by the projection inward of the floor of the external auditory canal. Diseased tissue being left in any of these situations will necessitate a second curettement, which must be done under general anesthesia, in which case the aftertreatment would be carried out on the same lines as above indicated.

In cases in which the eustachian tube does not close, there will be a constant discharge from the ear and the cavity will not heal.

A plan that has worked well in the hands of the writer is, at the first two or three dressings, to insert into the opening of this tube (which was thoroughly curetted at time of oper-

ation) a strong solution (1 to 500) of bichlorid of mercury, which is done by means of a small pledget of cotton on an applicator. This seems to have a stimulating effect in causing healthful granulation tissue to spring up in this situation and close off the tube. In cases in which granulations are sluggish, balsam of Peru may be used with good effect; while if the granulation tissue is of the irritable, or exuberant type, it will be necessary to use a strong solution of nitrate of silver (360 grains to the ounce).

Where these attempts fail, a thorough curettement of the tube to the isthmus should be performed, the Yankauer curette being a very useful instrument for this purpose.

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LXIX.

INSERTION AND SEAT OF RHINOPHARYNGEAL FIBROMATA.*

By D. Jacques, M. D.,

France.

Considering the number of years that surgeons have been concerned with fibromata of the postnasal chamber, evoking study after study, it may seem superfluous to take up from a rhinologic standpoint a question which many regard as finally settled.

No one will deny, however, that the ablation of these tumors through the natural passage, whenever possible, has markedly improved their prognosis, and the accomplishment of this with safety has been due to the persevering efforts of specialists. To improve still further the technic of eradicating rhinopharyngeal fibromata, our efforts should be directed toward ascertaining their seat and attachments. On this point classic statements are, as we shall see, far from constantly corresponding with the facts.

At present it is customary to assume that rhinopharyngeal polyps are tumors with a pharyngeal seat, primarily arising from the basilar process in the roof of the cavum, and only secondarily pushing forward into the nasal cavity.

"These are tumors," says Morell-Mackenzie (1882) "of a fibrous structure, which generally arise from the vault of the pharynx, often extend into the nasal fossæ and even the antrum, or descend into the pharynx as far as the epiglottis."

"We fully accept," says Gerard-Marchand in Duplay and Reclus' treatise (1891), "the modern conclusion that while in the immense majority of cases rhinopharyngeal fibromata are inserted into the basilar area, they may also originate upon the posterior orifice of the nasal fossæ, on the internal wing of the pterygoid process."

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*Report to the Third International Congress of Laryngology, Berlin, August, 1911.

More recently still, Mickulicz, in Heymann's Manual of Rhinology and Laryngology (1899), formulates an analogous opinion. "They are tumors," says he, "which take their origin from the thick, fibrous, chondroid covering of the cranial base, and belong structurally to the group of fibromata. Their seat of election is the basilar portion of the occipital bone, which corresponds to the most anterior region of the rhinopharyngeal roof. More rarely fibrous masses of the same nature are seen in the neighborhood of the choanæ and in the sphenopalatine fossa. Still more exceptionally they are atatched to the anterior aspect of the first two vertebral bodies, which are covered with a similar fibrous layer."

I believe it is useless to multiply citations. The unanimous sentiment of general surgeons still rests today upon the assertions of Nelaton and his school (1850), corroborated by the anatomic observations of Tillaux. "The inferior surface of the basilar process is covered," says the latter, "with a fibrous layer of considerable thickness. Its form is triangular. Its apex lies between the basilar process and the odontoid process. Its base looks toward the pharynx cavity. Its width in the adult is about 18 mm.; height, about 27 mm. The importance of this fibrous tissue comes from the fact that it is nearly always the point of origin of rhinopharyngeal polyps, those singular tumors which have a marked predilection for the male sex and for adolescents."

In sum, until lately, the customary opinion in surgical pathology was that hard, bleeding polyps, with a large base, in the postnasal space, necessarily took origin in the strong ligaments which unite the occipital to the first cervical vertebræ. All other attachments were adventitious. The tumor, born in the epipharynx, only secondarily invaded the face cavities.

True, the exclusivism of this conception was tempered with some reservations on the part of a few operators. Without mentioning the cases of Robert, of Michaux (Louvain), in which they saw pharyngeal fibromata with a cervicorachidian insertion, it is fair to recall that Gosselin admitted that these tumors sometimes arose from the back part of the ethmoid, and belong then to nasal pathology. For him their place of origin went in all directions much beyond the basilar covering, which, however, remained the center of the territory.

Now in place of the classic idea of a basilar origin and

primary pharyngeal seat for juvenile hemorrhagic fibromata, there has been for some years a tendency to substitute a new view, which I have endeavored to disseminate in various writings, namely, that of an ethmosphenoidal insertion and primary nasal seat of these neoplasms.

Without prejudging the operative and postmortem findings which should be determinative as a last resort, it is permissible to draw attention to certain clinical facts that are not harmonious with the generally accepted hypothesis.

On carefully reading again the published cases we notice constantly in the histories that one of the nasal fossæ is obstructed early, while respiratory embarrassment appears in the opposite side only at a relatively late stage of the trouble. Does an ordinary primary tumor of the epipharynx behave thus, for example a sarcoma of the pharyngeal tonsil, whose origin is exactly superposed upon the basilar fibrous coat? We know that in such a case the obstruction to respiration simultaneously involves both sides of the nose with a slight predominance on one or the other side, according to the case. On the other hand, experience teaches us that antral mucous polyps with a pharyngeal evolution produce a progressive nasal dyspnea successively upon the two sides, and not simultaneously, identical with the course observed in rhinopharyngeal fibroma.

Again, it is hard to understand how, on the hypothesis of a tumor originating from the roof of the cavum, there should be such a marked invasion of one of the nasal fossæ, and its upper annexes in particular, by a benign neoplasm whose weight ought to drag it downward into the free cavity of the pharyngeal tunnel. Above all, how shall we explain the perforations of the roof met with by many operators?

Such an evolution with such complications agrees admirably, we must confess, with the notion of fibrous proliferations implanted upon the upper wall of the nose. True, in the nasal portion of the cranial base there are no fibrocartilaginous layers comparable to those which cover the vertebral body of the occipital and upper spinal structures. But is such a layer necessary for fibromatous neoplasia, such as the narrow conception of Nelaton seems to demand? Do we not see fibrous tumors similar to rhinopharyngeal polyps, if not so vascular, arise from aponeuroses, from the periosteum, and even from the tegumentary connective tissue?

Further, fibromata of the nasal fossæ themselves have been noted and described by a number of authors. Morell Mackenzie has observed one indisputable case. I myself have recently observed two remarkable cases. One of these was a man beyond thirty. The growth had been present for six years, and only latterly had it invaded the cavum. It was inserted into the mesial aspect of the superior turbinal. The other was met with in a girl of eight. It started from the anterosuperior region of the ethmoid and had enlarged the glabella. In course of extirpation the rupture of a large cyst gave rise to a momentary suspicion of an unrecognized meningocele.

But before going further into the discussion, it is indispensable, I think, to state precisely what we understand by fibromata of the nose and pharynx. With the majority of authors I designate by this appellation tumors of generally firm consistence, usually tough, of fibroid texture, rich in vascular lacunæ, and having a thick, resistant pedicle directly attached to the bone. Development is slow and progressive; it leads at length to skeletal deformity by pressure. Histologically there is a hyperplasia of fibrous tissue with parallel fasciculi, generally poor in cells. Not rarely may be observed places of cellular proliferation with a sarcomatous appearance, or, again, foci of degeneration whose softening may end in the formation of cystic spaces, wholly different from those of true glandular cysts, of which mucous polyps furnish us such frequent examples. In places, also, may be seen connective fibers, dissociated by the edema, and on superficial examination resembling a simple irritative infiltration of the mucous chorion, analogous to that which gives rise to benign polyps.

These casual and partial analogies do not justify, to my mind, an association of true fibromata, the rhinopharyngeal polyps, with the diffuse hyperplasias, infiltrated with serum, which primary or secondary vasomotor disorders cause to arise in the mucosa of the ethmoidal region. These are hyperplasias which have been designated edematous fibromata after establishing the fact that they are myxomatous in appearance only. I differ, then, from Heymann (of Berlin) when he confounds in the same chapter of his Manual of Laryngology all the soft benign tumors of the nasal fossæ. I hold that there is room to distinguish clinically fibrous polyps or "rhino-

pharyngeal fibromata," from mucous and fibromucous polyps or "edematous fibromata."

Parenthetically, we must acknowledge that certain features attributed to rhinopharyngeal polyps by former writers are less absolute than is customary to admit, such as spontaneous hemorrhage, which may be lacking throughout, such as the narrow limitation of the 25th year for the period of accretion, and, finally, such as the exclusive predilection for the male sex.

A second point likewise demands precision. What is understood by "insertion" of rhinopharyngeal polyps? For a long time it has been observed that these tumors adhere to the walls of the face and neck cavities, not in one place only, but generally several places, which in a particular case justified employing the term, elsewhere abusive, of "polyps" as a designation. However, these multiple attachments are far from possessing the same significance. Some, variable in situation, are only adventitious, and result from secondary coalescence of surfaces eroded by reciprocal pressure. The others, much more fixed in situation, as we shall see, alone represent the primary insertion, the point of origin of the neoplasm. The extent varies in both, but the degree of resistance is quite characteristic in each class. The secondary adhesions scrape off easily with the nail or spatula from the subjacent tissue, especially from bone. Such detachment is impossible at the true pedicle, whose eradication inevitably brings with it osseous particles or even entire lamellæ of the compact substance. This is the pedicle in question when we discuss the insertion of rhinopharyngeal polyps.

Let us see now what a careful study of these facts teaches us:

About fifteen years ago I begged my colleague and friend, Prof. Moure, to operate by the natural passages upon a boy treated for several months in my clinic by electrolysis for a typical rhinopharyngeal polyp provoking copious hemorrhages. The operation revealed that the pedicle of the tumor went up into the right nasal fossa and was fixed in the sphenoid region. Moure, on that occasion, gave out the opinion that juvenile fibromata of the cranial base arose more often from the border of the nasal and pharyngeal cavities than from the roof of the cavum, an opinion which he affirmed the following

year at the French Society of Laryngology, elaborated later in the theses of his pupils, Latour (1901), Gautier (1904) and Duverger (1905).

Struck with the contradiction of the classic theory by my patient, I resolved to try to determine as exactly as possible the manner and place of insertion of rhinopharyngeal polyps which might come to my hands for operation. In May, 1908, I was able to present to the French Laryngologic Society six cases personally operated upon and cured. In all my patients the principal attachment was upon the anterior aspect of the sphenoid body, and extended more or less toward the root of the internal wing of the pterygoid apophysis, without involving in any way the body of the occipital. During the discussion of my paper a number of French and foreign special surgeons gave the support of their experience to the theory which I maintained (Moure, Beco, Lafitte-Dupont, Texier, Raoult, Castex). It was different at the French Surgical Society the same year, where I raised the question in answering an important paper presented the year previous by Prof. Tedenat of Montpellier. This author, out of 32 cases observed or operated on by him, in 26 found the insertion exclusively basilar; in 4 the place of attachment could not be exactly determined, and in the 2 others the tumor was fixed to the vomer and root of the pterygoid. Admitting the fewness of the cases personally observed, but carefully studied and all entirely concordant, I feel a right to conclude that the basilar insertion has at least frequent exceptions, that there is ground for inquiring if the classic notion did not originate from cases seen under especially unfavorable conditions, and that the theory of rhinologists who, along with Capart, Moure, Apert, Escat and Broeckaert, localize the pedicle to the sphenoid, does not contain more of truth.

It does not appear that my arguments sensibly affected the Nelaton theory in the minds of the general surgeons, judging by the discussion which took place two years later in the same society over a report by Prof. Rouvillois, of Val de Grace. This was an interesting case in a young soldier who recently died in his care, following repeated hemorrhages from a pharyngeal fibroma. Autopsy showed that the insertion of the polyp was upon the anterior aspect of the sphenoid body, encroaching somewhat interiorly upon the vomer and laterally

upon the root of the pterygoid. The floor of the sphenoid antrum was destroyed and an intrasphenoidal lobule of the growth adhered to the internal border of the excavation. The basilar process was entirely exempt.

Responding to this suggestive contribution, Prof. Kirmisson conceded that rhinopharyngeal fibromata, beside their basilar insertion, may extend their attachment to the border of the choanæ. It is seen that the dogma of a basilar origin for juvenile fibromata remains untenable. I also deemed it well to publish last year two new cases of mine, completely according with the others, making eight cases with eight sphenoidal insertions and no basilar insertion. This, it must be agreed, is something more than a fortunate coincidence.

Meantime (1909) Escat has brought to the support of my assertion a case observed by him from 1898 on, of a purely nasal fibroma, operated upon per vias naturales, which recurred at its pedicle, inserted in the posterior part of the nasal roof, and subsequently evolved into a typical rhinopharyngeal polyp which caused death by hemorrhage.

Since then Prof. Sieur (paper) and Prof. Gaudin (oral) have aided in confirming my theory by their personal statistics.

Let us sum up briefly the facts in this short discussion of the anatomic origin of rhinopharyngeal polyps.

The great majority of general surgeons at present still hold to the old doctrine based upon the teachings of Nelaton and his school, that the site of election of rhinopharyngeal polyps is the vault of the pharynx between the tubercle of the atlas and the beak of the sphenoid. They arise from the fibrous tissue which covers the basilar process in that region, and upon which rests the pharyngeal tonsil. Hence they are primarily pharyngeal tumors, but they may secondarily invade the nasal fossæ and their sinuses. Exceptionally their insertion may exceed the limits of the basilar coat, and descend to the bodies of the first cervical vertebræ, or advance upon the pterygoid, the choanal arch, or the vomer. Lastly, there is an extrapharyngeal variety (extra cavital) which originates in the fibrocartilaginous tissue of the irregular anterior opening (Bensch) and develops in the soft parts of the pterygomaxillary fossa.

During the past decade, in the rhinologic world, minute clinical and operative investigations have developed an opin-

ion decidedly, divergent from the old conception, big with operative importance, if not appreciable pathogenic deductions —rhinopharyngeal fibromata are tumors originating in the nasal fossæ, only invading the cavum after acquiring some size, and comporting themselves, as a whole, relative to their evolution, in a manner absolutely identical with that which we are accustomed to see in socalled "fibromucous" or "choanal" polyps. They arise from the most posterior portion of the middle meatus, and, dragged down by their weight, descend into the epipharynx, obstructing the choanæ successively, and sending digitations forward which fill the meatus of the corresponding nasal fossa. However, being less plastic than the other sort, rhinopharyngeal fibromata soon deform the wall of their originating cavity by a process of erosion from compression. Further, we see the vomer, its rear portion pushed toward the healthy side, thinned at its interchoanal border. The same is true of the sinus-nasal partition, which is thinned or destroyed, giving way to the continuous push of the neoplasm, which fills most of the pneumatic spaces of the affected side, by moulding itself into their irregularities.

From my personal investigations, in accord with numerous observations by rhinologists, it follows that the insertion is ordinarily a thick fold of tough tissue, with parallel fibers in the most posterior part of the nasal roof. The point most commonly involved seems to be the anterior surface of the sphenoid body, and more particularly the sphenoethmoidal recess. From this central point attachments may radiate to the upper choanal arch, the base of the vomer and pterygoid, the fossa of Rosenmueller (Moure), the posterior ethmoid, the sphenoid antrum and even the maxillary sinus.

Diverticular expansions of the growth are the rule; the most important and most constant being into the sphenoid cavity, which it sometimes considerably distends to a size equal to that of the intranasal lobe. The fact is easy to understand when we know the close connection of the fibroma with the sphenoid body. The posterior ethmoid cells are invaded with almost equal frequency, and imprint their septa upon the external surface of the polyp, giving it a lobulated aspect. The maxillary antrum also often conceals a voluminous prolongation whose entrance seems to be through the broken-

down posterior part of the ethmoid, rather than through a dilated accessory hiatus. The anterior ethmoid cells are less often attacked, and the frontal sinus usually escapes invasion.

Extranasal prolongations enter either the cranial cavity through the destroyed nasal roof, or the orbit through the resorbed papyraceous lamina, or the zygomatic and temporal fossæ, creeping through the distended sphenopalatine foramen (personal case).

Secondary adhesions may occur at any points where the growth touches a resisting wall; they are met with especially on the vomer portion of the septum.

Finally, as regards the seat of rhinopharyngeal fibromata, I have noted their marked predilection for the left side, a fact pointed out by divers authors, and especially by Escat, whose statistics entirely confirm my own (7 left sided cases, 1 right).

If the rhinologic cases favoring a sphenoidal origin of rhinopharyngeal polyps are at present sufficiently numerous and concordant to enforce conviction, the basilar origin is still firmly supported in the minds of general surgeons, by even more numerous reports and just as categorical. Now, the question of singular coincidence, of a fortuitous series, could not be invoked to reconcile these two distinct views. So I am tempted to explain the divergence by erroneous interpretation on the part of the older writers. How much is explained by the difficulty of confirming with precision the exact attachment of a tumor which at once fills the pharynx, the nose and its annexes, after distending them, deforming the cavity and dislocating the walls? How can we determine the true pedicle in the midst of adventitious adhesions, often extensive, in the depths of an operative cavity flowing with blood from the operation wound as well as the tumor itself? We should not forget that the cases reported by the surgeons were diagnosed late in an advanced stage, and extirpated, as Kirmisson says, by operators "desirous above all of acting quickly, operating under chloroform, tearing, curetting and cauterizing in a bloody field."

And, speaking of the easy confusion in recognizing the point of attachment, I myself have been a victim. In the course of one of my operations I got the impression for a moment that fixation of the neoplasm extended to the roof of the cavum;

an illusion caused by enormous enlargement of the left choana, hindering both finger and eye from exactly finding the limits of the nose and pharynx. Whatever skill one may have in rhinoscopy, it is sometimes singularly hard to orient oneself in a region so greatly changed by erosion and displacement of the vomer, lowering of the pharyngeal roof, distension of the choana, with atrophy and flattening of the turbinates, effacing gradually the demarcation between the nasal fossa and the pharynx cavity.

In the presence of this incertitude, finding the pharyngeal tonsil intact, which is easily recognizable in the young, furnishes high testimony that the subjacent basilar covering is a stranger to fibroma. By observing integrity of Luschka's tonsil I was able to enlighten myself in a case where the roof of the cavum, lowered by a large intrasphenoidal prolongation, at first caused me to regard it as the tumor itself extending down the posterior wall of the pharynx.

I believe, then, that contrary to the classic notion, the point of origin of rhinopharyngeal polyps should usually be sought for about the posterior recess of the nasal roof, and that only exceptionally their attachments go back of the choanal plane and extend onto the basilar process of the occipital. Contrary affirmations no doubt rest upon errors of judgment or observation.

Besides the array of material facts, the theory I hold would be greatly strengthened if these facts could be connected with some special anatomic peculiarity of the region involved, thus explaining the singular predilection of hemorrhagic fibromata for it. But, up to the present at least, no such peculiarity has been found which does not apply equally to the basilar region.

Rhinopharyngeal fibromata, to my mind, are only simple irritative proliferations of accidental cause, like mucous polyps. Their tendency to recurrence and to penetration of surrounding regions ought to class them among the tumors proper, while the constant absence of generalization separates them distinctly from the cancer group. They present themselves, then, as a result of a metabolic superactivity of part of the bony cranial base in the course of its normal period of rapid evolution. Why does this excessive superactivity of the periosteum prefer the sphenoid body to the body of the occipital? Bensch contents himself with saying that for unknown

reasons, a circumscribed region of the cranial base, prevented from making bone tissue, vents its formative activity by producing fibrous tissue. This proposition is more acceptable, to my mind, with its vagueness, than the seductive and precise theory of Tillaux concerning the occipitorachidian network.

I do not know how many other explanations for the pathogeny of rhinopharyngeal polyps have been advanced. Dr. Delsaux has acquainted me with an original conception in a report, as yet unpublished, to the Belgian Laryngologic Society. According to him the term "rhinopharyngeal polyp" covers a multitude of tumors that are different histologically and different in their malignity and course. They doubtless take origin in various tissues, epithelial or connective tissue remnants establishing temporarily, in the course of embryonal development, communications between the cephalic intestine and the cranial cavity across the vault of the pharynx.

It would be desirable if our histopathologic knowledge were better supported in respect to these neoplasms, and no doubt a methodical effort in that direction would dispel much obscurity and theoretical discussion. I would object, however, to my colleague's view, by saying that the "communications" he speaks of are doubtful, except Rathke's diverticulum, which, contrary to Romiti's opinion, seems rather should be localized between the two sphenoids and not in the pharyngeal fossa of the occipital. In any event, the frankly lateralized beginning of juvenile nasal fibroma seems to me to set aside in most cases the hypothesis of embryonal origin from diverticula.

Still, the course of these peculiar tumors agrees very well with the notion of an exaggerated accidental proliferation during adolescence, of a connective tissue mass precisely localized, probably the periosteum of this curious region about the cranial base, which corresponds to the anterior extremity of the notochord, and marks the limit between the primitive base of the membranous skull (sphenooccipital portion) and the superadded part, following the progressive incurvation of the cephalic end of the cerebral vesicle envelopes (ethmoid portion).

If we follow the fetal development of the limited region which, in the embryo, on the brain side, contains Rathke's median cranial pillar, and on the intestinal side the hypophysal pharyngeal diverticulum, we recognize that it corresponds to

the junction of the bony outlines of the two sphenoids to the basal cartilaginous plaque. There converge from each side the two ossification centers of the presphenoid and the five centers of the basisphenoid. There persists on the ventral side, between the sphenoids which are fused above, a fibro-cartilaginous mass which disappears only after birth.

To conclude from this simple fact that there is a pathogenic relation would be to exceed our information. Only from anatomic and anatomopathologic research in the future can we expect explanation and confirmation of the condition to which I am content to direct attention, by reason of its immediate practical interest, that is to say:

The fibrous tumors of adolescence known as rhinopharyngeal polyps usually have their origin in the rearmost part of the nasal roof and not the roof of the cavum. They are inserted principally upon the anterior surface of the sphenoid body, and not upon the basilar coverings. They early invade the nasal annexes and particularly the sphenoid sinus, before involving the epipharynx.

LXX.

CONSERVATIVE RADICAL OPERATION ON THE MIDDLE EAR.*

By Dr. Stacke,

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By the term "conservative radical operation" is understood the radical laying bare of the middle ear space, with the preservation of as much as possible of the tympanic membrane and ossicles.

I wish to bring to your attention certain points of view which I do not find mentioned in literature, but to which I have devoted my attention for the last sixteen years. Panse, Scheibe, and Jansen appear to be the first who, early in the nineties, soon after the introduction of the radical operation, made any attempt to preserve the ossicles in this operation. I myself in 1897 recommended their preservation, and later Siebenmann several times recommended the preservation of the ossicles. We have not yet, however, fully determined under what circumstances the ossicles should be preserved in the radical operation, and when they should not. Cases are described with perforations in Schrapnel's membrane, and with very varying perforations in the pars tensa of the tympanic membrane, and cases with well-preserved and with very poor hearing.

There are also many methods of operation which are recommended. Most authors leave a portion of the bony ring in order to give the drum membrane a point of attachment. Others recommend protection of the lateral wall of the attic, or say not to open the aditus, or only so far that the insertion of drum membrane still remains. Yet others recommend opening of the antrum from the external canal only. All

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authors are, however, in unison in proposing that the auditory ossicular chain be kept intact in its continuity, so as to obtain the most hearing possible. Many consider the breaking of the ossicular chain at the long process of the anvil, as well as disease or absence of the anvil itself, a contraindication for the operation, with the idea that after the breaking of the union between the anvil and the attic, the preservation of the other ossicles is of no more value. Few authors pay much attention to the condition of the tympanic membrane and the tympanic cavity. Others are opposed to the preservation of the chain of ossicles and their remains, and in general to any efforts supposed to be conservative. In short, up to the present time, there appears to be no unified point of view or strict indications, and the question is left in great part in doubt or undecided concerning the value or lack of value of the radical operation.

Such being the case, I desire to urge upon my colleagues some agreement in regard to this question, and am therefore bringing before you my experiences in this department of otologic surgery. My material comprises fifty-one cases, taken from private practice, all of which have been cured with the exception of five cases, which are still under treatment. These cases not being clinic cases have been observed from the beginning to the end of the treatment, and I am still able to see them at longer or shorter intervals of time. I endeavor in all cases to preserve the tympanic cavity, approaching as far as possible to the normal, keeping it entirely closed toward the external canal, and have selected my cases with this point in view.

Improvement of hearing and the preservation of the tympanic cavity is the goal which I attempt to attain in all of my cases. This presupposes a definite indication, and also a definite, well-determined anatomic condition as an absolute necessity. I save the tympanic membrane and the auditory ossicles, preserving the pars tensa of the tympanic membrane and completely closing off the tympanum. Bondy comes the nearest to my point of view. In 1909 he reported four cases in which he preserved a very good hearing power. In one of these cases, however, the tympanum was not closed off.

My first case was reported in 1895, and was published in 1897. In the same year I reported the precise indication for

the operation. I have not used the conservative treatment in old, chronic perforations of the pars tensa, because I consider it less promising in these cases, and for the most part contraindicated.

The characteristic findings in the attic, aditus and antrum, which are indications for the operation, may be divided into three groups. First, fistula lying high up in Schrapnel's membrane, either in front of, above or behind the short process of the hammer, as well as into the fistula, or greater or less destruction of the lateral attic wall. Second, pathologic separation of the drum membrane behind and above, with secondary adhesion of its border, and attachment to the surface of the labyrinth wall or the wall of the aditus underneath the prominence of the facial. Third, the much more seldom perforation of the floor of the antrum at the side of the aditus into the posterior superior bony portion of the external canal. In these three groups of otologic conditions, it being assumed that the tympanic membrane is present, one finds almost without exception complete closure of the tympanum. The air douche through the catheter results in no perforation noises, while the normal bubble noise is the surest evidence that the tympanum communicates only with the eustachian tube, and is closed on all other sides from any cholesteatoma or suppurative focus in the accessory cavities. Such a tympanum does not suppurate, perhaps has never suppurated. Our present theory in regard to cholesteatoma coincides with this supposition.

Bezold has already stated that without previous suppuration, and following chronic exudation, there can be atrophy of the tympanic membrane and closure to the tube, with the result that Schrapnel's membrane can be finally worn away and the ingrowing of epithelium into the attic space made possible. Witmaak also states the origin of cholesteatoma in a similar way. I was previously a skeptic in regard to this theory, but certain experiences have convinced me of the possibility of its occurrence. Isolated acute suppuration of the attic, if neglected, may also bring about the same condition. It can be stated that we all knew about these conditions long ago, but that they are seldom found among the great mass of cases requiring the radical operation. That I formerly believed, but if one pays especial attention to these forms one will

be continually astonished with the frequency with which they are to be found.

During the last ten years I have systematically studied these cases, but, unfortunately, have neglected during all the years to make statistical notations concerning the frequency of these conditions in comparison with the number of radical operations. During the last three years I have made incomplete notations, and have found that, excluding cases with intracranial and difficult complications, among sixty uncomplicated radical operations there were thirty which presented one of the three conditions above described, with closure of the tympanum, and so could be conservatively operated upon; that is, fifty per cent.

It may be accidental or unusual that these cases have been so often met with by me during the last few years, but if it should be proven that over a longer period of time the percentage of these cases has to be changed somewhat to their disadvantage, I nevertheless believe that a considerable proportion of cases will remain where patients with closed tympanic cavities can be radically operated upon, and cured, with the tympanic cavities still closed. A more ideal cure cannot be brought about. Complete epithelization of the antrum, aditus, and attic, with preservation of the tympanic membrane, normal sometimes, in others somewhat lessened in size, but with the tympanic cavity closed toward the outside. Under these circumstances, the much-to-be-feared recurrence of the tubotympanic suppuration is prevented. Where under other conditions the purulent process would be started up again, here there is only the exudation, which after breaking through the drum membrane becomes absorbed. When one thinks how much labor it often causes to get the freely opened purulent tympanic cavity dry, and what expense of labor is necessary to skillfully close the tympanic end of the eustachian tube, it is easy to understand how much the closed tympanum is worth in the radical operation, and will never fail to make use of this advantage.

In all of my fifty-one cases a lasting closure of the tympanum was obtained in all but one. When I put the closure of the tympanic cavity as of the first importance, as an end worth striving for, I do not leave out of consideration the point of view that the power of hearing is to be improved

as much as possible. Both things occur simultaneously in many cases.

Disagreeing with Bondy, Barany, Urbantschitsch and others, I found the power of hearing often very well preserved, either quite or almost the same as normal. This power of hearing remains in my cases, as in those of the authors mentioned. We do not need any more to be afraid to operate radically on an ear with a good degree of hearing, provided the above conditions are present, even though it is the only one that has good hearing. I emphasized this in Hamburg in 1899, when Reinhard was afraid to operate on a case of cholesteatoma with a fistula high up, and with otherwise intact tympanic membrane, because he feared that the hearing power, which was good, might suffer through an excision of the ossicles. This fear was quite proper, since all authors agree that in such a case by excision of the ossicles one risks a very considerable loss of hearing, not to mention that the formerly sound tympanum may be involved in the suppurative process.

On the other hand, I have usually found very little improvement in hearing when it was already very bad, that is, cases where a whisper is heard only in the immediate neighborhood of the ear. Here excision of the ossicles usually improves the hearing only a little, or not at all. Even supposing there was a little improvement after ossiculectomy, I would not excise the ossicles, but would preserve them with the tympanic membrane. Five times I have seen an improvement in hearing from one-quarter meter to one meter, or one and one-half meters, and four times from one-quarter meter to four meters. With moderate hearing power I have known and have achieved decided improvement, but this cannot be with certainty reckoned upon.

The results of ossiculectomy are also entirely uncertain. Loss of hearing can follow this operation also. The conservative operation loss is less likely to occur. As a rule one has at least as good hearing as existed before the operation. I have, however, in two cases with moderate hearing, seen a loss of from three meters to one meter, and from four meters to two meters. Here I ascribed the blame to the faulty omission of catheterization at the right moment after the operation. I lay great value upon this. One of these cases finally had chronic nephritis. In cases of moderate hearing

I have seen decided improvement in ten cases, the hearing distance increasing from one and one-half meters to five meters, from one-half to six meters, from three to seven meters, from three-quarters to three, from one to two meters and the like. Not counting any improvement of less than one-half meter, on account of possible mistakes in testing, my results show in twenty improvement, in two cases loss, in twenty-four cases unchanged hearing distance, and five cases are not yet completed. The prospects then for hearing by the conservative method are certainly not worse than by excision, and probably considerably better. The great advantage of the conservative operation is that we have destroyed nothing, and that excision of the ossicles is still open to us after the result in healing of the suppurative process. There is also the chance that the tympanic membrane may regenerate after ossiculectomy.

In every case where there is good, fair or even bad hearing, I consider the conservative method, as compared with ossiculectomy, as superior, provided that the tympanic membrane and the tympanic cavity are preserved.

The obtaining of a closed tympanum depends entirely upon the operative technic. If one allows the bony ring to remain, one cannot depend upon the closing off of the tympanum. I never allow any of the annulus (ring) to remain. My method of operation, which I have used without exception from the first to the last case, differs not at all from that which I have stated to be necessary for all cases to be operated upon radically. After laying bare the external ear and the external canal, the socalled first part of the operation, I search for the fistula over the pars tensa of the drum membrane, and successively open all the neighboring spaces, the attic, aditus and antrum. I cut away then the entire bony covering of the antrum, leaving it widely open, exactly as I have previously written, so that every space is widely open outwardly, as in every radical operation. The external canal plastic I make also in the same manner as previously described, so that we have the widest possible opening.

By this means I protect most carefully the ossicles and the tympanic membrane. Bondy comes the nearest to me in the method of operating, although he does it in a reverse way. If I have understood him correctly, he allows no bridges or

bony borders to remain. In some cases where the fistula lies behind the short process, I allow the anterior part of the outer attic wall to remain. In such a way, however, that the head of the malleus remains visible. Usually I remove the attic wall as widely as possible, opening the aditus in the same way, and sloping the back wall of the auditory canal down to the plane of the facial nerve. I disturb the ossicles as little as possible, even when, as is usually the case, they are covered more or less with granulations. Either the granulations shrink of themselves in the course of the after-treatment or through cauterization, the use of silver nitrate or chromic acid. Even carious places heal perfectly after the operation. By this method of not disturbing the ossicles, defects in the long process of the incus remain undisturbed. In cases where the tympanic membrane is found loosened behind and above, and has already found a new insertion medially, and has become in part attached to the wall at the point of perforation, the tympanum is frequently not opened during the operation. I have repeatedly convinced myself of this by the use of the catheter in auscultation immediately after the operation. In other cases it is unavoidable in the laying bare of the aditus not to loosen the tympanic membrane, and therfore to open the tympanum. The edge of the tympanic membrane heals again almost without exception, mostly underneath the facial canal along the under side of the medial wall of the aditus or directly onto the incus itself, and moreover so promptly that I take no care at all for it after the first dressing. I catheterize after the fourth or fifth dressing (I have not risked it any earlier), and find that the tympanum is always closed again. In one case alone out of the fifty-one did the closing of the tympanum fail. Here there existed, after successful healing, a communication through which a stream of air passed during catheterization. I had some difficulty in a second case, but after several weeks the edge of the tympanic membrane healed following the use of caustics. I have seen this case after four years, and the tympanum remains completely closed, and everything entirely healed. In eight cases, where the long process of the stapes was plainly carious and its communication with the stapes apparently loosened during the operation, I have excised the incus. In these cases the edge of the tympanic membrane healed again, and a closed tympanum was attained.

I may, therefore, claim as suitable for my conservative method for the preservation of the tympanic membrane, those cases where the chain of auditory ossicles is already interrupted, in which case the number suitable for the operation naturally increases considerably. Hitherto such cases have been considered adapted only for excision, because the malleus and the incus had become worthless functionally. Such cases are suitable for the operation, provided the tympanic membrane and the hammer are preserved.

I have recently had a case in which the incus on both sides was removed in a radical operation two years before. Healing quickly followed within eight weeks, and with a closed tympanic membrane. Contrary to expectation, the power of hearing increased from one-quarter to four meters, and this result has been lasting. I think that in this case the tympanic membrane has become attached to the head of the stapes. One could scarcely account for the resultant improvement in hearing except as the result of the shrinking occurring after the healing of the mucous membrane surrounding the ossicles. This explains many an improvement in the hearing after the customary radical operation. If the incus is not found in the operation, it having been already removed, it is not necessary to excise the tympanic membrane and the malleus, provided there is no prospect of a lasting closure of the tympanum. In view of the distinct result which the conservative radical operation promises where the tympanic membrane is saved, in view of the absolute lack of danger which stamps the operation as an almost harmless interference, in view of the absolute painlessness of the after-treatment, in view of the possibility of operating on feeble patients and those with heart disease under local anesthesia, in view of the absolute certain results in healing, I would ask for such cases an enlargement of the indications for the radical operation, but under the supposition that the tympanic membrane and the hammer are preserved as well as that a closed tympanic cavity remains. I would recommend as soon as the diagnosis is secured to propose the operation to the patient without experimenting with the usual conservative treatment through the audiory canal, which conducted even by the lightest hands, has to patients capable of judging, proven much more disagreeable than the after-treatment following the operation.

Even after a long course of treatment even should the suppurative process subside, we are not in a position to guarantee the patient a real cure, but when he is radically operated on he is dismissed cured after a treatment covering about eight and a half weeks. For that reason I consider that the non-operative treatment cannot be considered as absolutely harmless. Frequent use of the probe and frequent cauterizations can cause injury in the socalled conservative treatment. At all events, the functional result is very much more certain to be good if as little as possible of the diseased part has been manipulated before the operation. On all these grounds I plead for the conservative prophylactic mastoid operation as soon as the diagnosis is absolutely fixed, presupposing always that the cases are appropriate ones for operating, and that the arguments for and against have been carefully weighed in each case. One must individualize and not follow a model.

My operations have been performed for the most part under narcosis. I have often used the local anesthesia method of Neumann, using novocain with the addition of two drops of suprarenin to every cubic centimeter. Even when I use narcosis I previously inject this solution under the skin wall of the bony auditory canal behind and above. This enables me to avoid any severe hemorrhage from the deeper part of the wound, and allows me to operate almost without bloodshed. I have almost never experienced any disadvantage therefrom. With a few exceptions I use Thiersch's flaps in the second to the fourth week, that is, as soon as good granulations cover over a portion of the exposed bone. The one in the back is kept open up to that time. Then I let this close itself or close it through a secondary suture. The period of healing varies from five to thirteen weeks, and has an average of eight and a half weeks. I consider it important to catheterize occasionally during the after-treatment, in order to prevent broad adhesions of the tympanic membrane to the wall of the labyrinth. Where rales appear in the tympanum the condition of the eustachian tube, the nasopharyngeal space, and the nose, must be taken account of.

LXXI.

SUMMARY OF ANNUAL REPORTS OF THE TUBERCULOSIS SANATORIA IN THE UNITED STATES OF AMERICA AND CANADA.

By J. W. Gleitsmann, M. D.,

New York.

This report is made along the same lines as the one of last year in the fourth volume of *The Centralblatt,* page 376. Statements as to location, arrangement and medical supervision are not repeated here except where changes have been made. In the case of newly erected institutions, this data is given. The same abbreviations are used, namely: a. c. (apparently cured), and d. q. (disease quiescent).

The reports have come in this year more slowly than usual. Thirty-eight have been received up to June 15, 1911. Five institutions which reported last year failed to do so this year. Eleven sanatoria reported which had not done so before.

CANADA.

1. Gravenhurst (Ontario).—Muskoka Cottage Sanatorium and Muskoka Free Hospital for Consumptives. Thirteenth annual report, September 30, 1909-10. 149 of the 257 patients in the Cottage Sanatorium remained for some length of time. Of 35 in first stage, 5 a. c. (14%), 24 d. q. (68%). Of 89 in second stage, 2 a. c. (2.2%), 22 d. q. (24.7%). In the thirteen years of existence 16.5% were apparently cured, and in 35% the disease became quiescent. The Free Hospital was increased to twice its former size during the year. Of 262 patients, 234 remained longer than six weeks. Of 87 in first stage, 15 a. c. (17%), 41 d. q. (45%). Of 70 in second stage, 1 a. c. (1.3%), 13 d. q. (18%).

2. Hamilton (Ontario).—Mountain Sanatorium. Sixth annual report, September 30, 1909-10. A new pavilion and children's ward have been erected. Of 136 patients, 96 stayed

longer than one month. Of 20 in first stage, 6 a. c. (30%), 3 d. q. (15%). Of 44 in second stage, 5 a. c. (11%), 11 d. q. (25%).

3. WESTON (Toronto, Ontario).—Toronto Free Hospital for Consumptives and King Edward Sanatorium for Consumptives. Sixth annual report, September 30, 1909-10. A pavilion with twelve beds and a new administration building have been erected since the last report. Only advanced cases received. In the Free Hospital, of 930 patients admitted in six years, 5 a. c., 39 d. q. In the King Edward Sanatorium, in three years, of 236 patients, 23.2% improved.

VERMONT.

4. PITTSFORD.—Vermont Sanatorium. Third annual report, 1909-10. 98 patients discharged. Of 39 in first stage, 15 a. c. (38.5%), 12 d. q. (30.8%). Of 58 in second stage, 4 a. c. (6.8%), 17 d. q. (29.4%). Of 24 patients who stayed over three months who were in first stage, 14 a. c. (58.3%), showing the importance of a longer stay. Tuberculin was used in the cases of those who desired it with good results.

MASSACHUSETTS.

5. (a) RUTLAND. — Massachusetts State Sanatorium. Thirteenth annual report, November 30, 1908-09. Because of the large number of applicants the state has built three new sanatoria, soon to be opened. In the past year 652 patients treated; average time, six months and ten days. Of 208 in first stage, 125 a. c. (61.5%), 52 d. q. (25.6%). Of 341 in second stage, 43 a. c. (12.6%), 147 d. q. (43%). Tuberculin was used in 23 cases with good results, and the previously reported laboratory studies continued.

(b) Fourth annual report of the Trustees of the Massachusetts Hospital for Consumptives, November 30, 1909-10. This board has charge of the three sanatoria and also of the Rutland Sanatorium. Rutland State Sanatorium.—Of 269 patients in first stage, 106 a. c. (39.4%), 118 d. q. (43.8%). Of 239 in second stage, 38 a. c. (11.5%), 141 d. q. (42.8%).

6. North Reading State Sanatorium (E. B. Emerson). Opened September 22, 1909. 392 patients in the past year;

276 discharged; 5 a. c. (1.8%), 32 d. q. (11%), 94 improved (30%).

7. Westfield State Sanatorium (H. D. Chadwick). Opened February 16, 1910. 371 patients; 69 first stage, 91 second stage. 180 patients discharged; 5 a. c. (3.1%), 7 d. q. (4.4%).

8. Lakeville State Sanatorium (S. Coolidge). Opened January 6, 1910. 159 patients discharged; 5 a. c. (3.1%), 7 d. q. (4.4%).

9. Boston (Maltapan).—Boston Consumptives Hospital and Day Camp (Edwin A. Locke). Hospital opened October, 1910, Camp July, 1908. First, second, third and fourth annual reports, ending January, 1907, '08, '09, '10. In 1906 the state bought fifty-five acres and made appropriation to furnish accommodations for 250 patients in order to relieve the Rutland Sanatorium and to take in advanced cases. In the fourth year in the first ward of the main building, 104 patients were received and 50 discharged. In the men's pavilion, 62 were admitted, 39 discharged, all advanced cases. In the camp, 683 patients were treated and a school for tuberculous children, in which they are taught hygiene and receive proper nourishment, was equipped.

10. Sharon.—Sharon Sanatorium. Nineteenth annual report, December 1, 1908-09. For women only. Fees, $5.00 weekly. Of 57 patients during the year, 25 a. c. (53%), 9 d. q. (19%) Tuberculin used often, both for diagnosis and treatment.

RHODE ISLAND.

11. Wallum Lake.—State Sanatorium. Fifth annual report, 1909. New buildings for laundry and heating plant. All cows in dairy tested with tuberculin. 290 patients discharged, average stay 143 days; 29 a. c. (10%), 105 d. q. (36.2%). 173 patients remained 50 to 701 days. Of 17 in first stage, 12 a. c. (70%), 5 d. q. (29.4%). Of 152 in second stage, 16 a. c. (10.5%), 75 d. q. (49.3%). Sixth annual report, 1910. Institution has now 130 beds. 288 patients discharged, average stay 153 days; 19 a. c. (6.6%), 102 d. q. (35.4%). 169 patients remained 90 to 833 days. Of 10 in first stage, 4 a. c. (40%). 5 d. q. (50%). Of 155 in second stage, 14 a. c. (9%), 73 d. q. (47%).

CONNECTICUT.

12. HARTFORD.—Wildwood Sanatorium. Annual report, September 30, 1909-10. 151 patients discharged, average stay 108 days; 11 a. c. (7%), 39 d. q. (26%). 65 patients remained 3 to 18 months. Of 16 in first stage, 7 a. c. (43%), 7 d. q. (43%). Of 37 in second stage, 2 a. c. (5.4%), 19 d. q. (51%). Tuberculin in suitable cases.

13. WALLINGFORD.—Gaylord Farm Sanatorium. Sixth annual report, May 1, 1909-10. 166 patients discharged; 104 stayed on an average 161 days. Of 23 in first stage, 3 a. c. (13%), 18 d. q. (78%). Of 75 in second stage, 1 a. c. (1.3%), 20 d. q. (27%). Statistics from 1904 show: 513 patients, 50% in first stage, 24% in second stage either a. c. or d. q. Because of lack of space the comparison of results between patients treated with and without tuberculin cannot be given.

NEW YORK.

14. RAY BROOK.—New York State Hospital for the Treatment of Incipient Tuberculosis. Ninth annual report, 1909. Present capacity of 160 beds will be increased during 1910 to 248. Of 262 patients discharged, 231 remained on an average nine months. Of 128 in first stage, 100 a. c. (78%), 18 d. q. (14%). Of 79 in second stage, 16 a. c. (20%), 44 d. q. (55.6%). Attention is called to the long waiting list and to the necessity of an early diagnosis.

15. Albany Central Federation of Labor Tuberculosis Pavilion (A. T. Laird). Second annual report, May 1, 1909-10 Founded by and under the control of the central committee of the labor unions of Albany, fourteen of which contribute towards its support. High situation in the southern part of the city, capacity 14 patients, two sick wards. During the year 30 patients were admitted, 6 in first stage, 6 in second stage; 4 a. c., 6 d. q.

16. LAKE KUSHAQUA.—Stony Wold Sanatorium. Ninth annual report, 1909. During the year many liberal bequests have been received which will be used for new buildings. 130 patients remained on an average of twenty-seven weeks. Of 34 in first stage, 24 a. c. (70%), 6 d. q. (17%). Of 70 in second stage, 8 a. c. (11%), 29 d. q. (41%). Of the 24 chil-

dren, 16 were in first stage, 12 a. c. (75%), 2 d. q. (12.5%); 8 in second stage, 2 a. c. (25%), 2 d. q. (25%). An industrial bureau has been opened which provides support and furnishes positions to those who have been discharged as cured or improved, so that it may not be necessary for them to engage in work which might be injurious to them.

17. LIBERTY.—Loomis Sanatorium. Fourteenth annual report, October 31, 1909-10. During the year a building for employes was erected and a pavilion enlarged. In the pay wards 242 patients were discharged, of whom 187 remained more than one month, 23 a. c. (12.3%), 29 d. q. (15.5%); 16 of these were in first stage, 8 a. c. (50%), 3 d. q. (18.7%); 88 in second stage, 15 a. c. (17%), 22 d. q. (22.7%). In the free wards 139 discharged, 24 a. c. (17.2%, 42 d. q. (30%). Tuberculin was used in selected cases.

18. NEW YORK.—(a) Montefiore Home for Chronic Invalids. Twenty-sixth annual report, September 30, 1909-10. The wish of the directors to erect a larger institution in a more suitable locality is soon to be realized by the purchase of a large area in the northern part of the city. 472 patients were treated during the year, 122 of whom had tuberculosis. 47 of these were discharged, 9 improved.

(b) Montefiore Country Sanatorium. 564 patients treated, 231 in first stage. Of these, when discharged, 41 a. c. (17%), 63 d. q. (27%). Of 17 advanced cases, 1 a. c., 11 d. q.

19. SARANAK LAKE.—Adirondack Cottage Sanatorium. Twenty-sixth annual report, October 31, 1909-10. With the means at their disposal a new road has been built which makes access to the place much easier. 321 patients treated, 211 discharged; 37 a. c. (17.5%), 117 d. q. (55.5%). 191 patients remained on an average over six months. Of 51 in first stage, 25 a. c. (49%), 19 d. q. (37%). Of 136 in second stage, 10 a. c. (7%), 91 d. q. (67%). Tuberculin treatment of 124 patients produced no essentially different results.

20. SARANAK LAKE.—Tuberculosis Reception Hospital (Edward R. Baldwin). Ninth annual report, February 1, 1909-10. Capacity, 18 patients; situated on a hill. Takes patients who need attention and are stopping at the place and those who cannot be taken into the Cottage Sanatorium. 135 patients discharged, 5 in first stage, 76 in second stage; 11 d. q. (13.5%), 65 improved (80%).

21. YONKERS.—Sprain Ridge Hospital (Wm. Vogeler). First and second annual reports, October 1, 1908-09-10. Elevation, 250 feet. 120 acres, administration building and four pavilions with six beds each. Terms, $7.00 a week. The report of the second year shows that of 51 patients discharged the first year, 40 are now in good health.

The second report shows 47 patients treated, 32 discharged; 17 in first stage, 17 d. q. (100%), 6 in second stage, 6 d. q. (100%). It is likely that some physicians would have designated these cases as a. c. Tuberculin and X-ray were used.

NEW JERSEY.

22. GLEN GARDNER.—New Jersey Sanatorium for Tuberculous Diseases (S. B. English). Ninth annual report, October 31, 1909-10. Situated on a hill facing south, 1000 feet above the sea level, 600 acres. Building for steam heat, lighting, administration building with pavilions facing east and west. One pavilion higher than the others, capacity 175, for the more hopeful cases. Of 358 patients discharged, 286 remained more than a month. Of 130 in first stage, 75 a. c. (58%), 52 d. q. (40%). Of 113 in second stage, 5 a. c. (4.4%), 51 d. q. (45%). The records show that of patients discharged from 1907-09, 163 a. c., and 57 of the 146 d. q. are now able to work.

PENNSYLVANIA.

23. MONT ALTO.—State South Mountain Sanatorium. Annual report, May 31, 1908-09. The institution was enlarged by the erection of a new building of 144 beds. 589 patients discharged during the year, 125 d. q. (21%), 281 improved (47%). Of 67 in first stage, 34 d. q. (50.7%), 28 improved (41%). Of 252 in second stage, 50 d. q. (19%), 139 improved (55%). Money has been appropriated by the state legislature for two additional sanatoria, and land has already been purchased in the western part of the state, in Cresson, in the eastern part in Hamburg.

24. SCRANTON.—West Mountain Sanatorium. (J. M. Wainwright). Eighth annual report, 1909. Of 30 patients discharged during the year, 5 a. c. (16%), 20 improved (66%).

25. WHITE HAVEN.—White Haven Sanatorium (President, L. F. Flick; Director, A. Armstrong). Twelfth annual re-

port, March 1, 1909-10. Since its foundation in 1901 up to the present time, poor patients were treated for nothing; now, however, that the state has erected sanatoria and his withdrawn its support from the White Sanatorium, it charges $7.00 to $9.00 a week. Capacity, 216. Elevation, 1500 feet; area, 215 acres. With donations received during the past year a pavilion and a shack for advanced cases have been erected. 586 patients discharged, 196 having remained from 1 to 3 months, 2 d. q. (1%), 21 very much improved (10.7%). Of 293 who remained more than three months, 66 d. q. (22.5%), 82 very much improved (28%).

MARYLAND.

26. SABILLASVILLE.—Maryland State Tuberculosis Sanatorium (V. T. Cullen). Third annual report, 1909. Capacity, 210. Elevation, 1500 feet; 198 acres. Terms, $3.50 a week. Administration building, 9 pavilions each for 20 patients, a hospital for 20, and a building for 10 convalescents. 246 discharged since the institution was opened in August, 1908. Of these, 97 remained three months or less. Of 27 in first stage, 7 d. q. (7.2%), 42 improved (43%). 149 remained on an average 160 days, 5 a. c. (3.3%), 52 d. q. (34.9%), 73 improved (48.9%).

MISSOURI.

27. MOUNT VERNON.—Second annual report, 1910. A new building for 70 patients has been erected, bringing the total capacity up to 140 beds. Of 347 patients, 94 d. q. (27%), 131 improved (37%). Tuberculin preparations are being used for diagnosis and treatment.

ILLINOIS.

28. NAPIERVILLE.—The Eward Sanatorium. Annual report, 1909, with an account of the activity of the institution since its founding in 1907. Capacity, 60. A throat ward and a laboratory have been erected. 313 patients discharged, 76 remaining less than one month. Of the remaining 277, 176 in first stage, 60 a. c. (35%), 80 d. q. (45%), 91 in second stage, 36 d. q. (39.6%). 19 were treated with tuberculin, 27 with B. E., and 43 with B. F.

MICHIGAN.

29. HOWELL.—Michigan State Sanatorium. (E. B. Pierce). Second annual report, July 1, 1908-10. Six new pavilions erected, capacity now 80. 90 patients discharged in 1909, 32 in first stage, 18 a. c. (56%), 7 d. q. (21%). Of 104 discharged in 1910, 27 in first stage, 13 a. c. (48%), 7 d. q. (25.9%); 56 second, 4 a. c. (7%), 21 d. q. (37.5%).

MINNESOTA.

30. WALKER.—State Sanatorium for Consumptives (S. B. Ohlinger). Report from July, 1908-10. Six new pavilions, capacity now 110. During the two years 314 patients discharged. Of 62 in first stage, 17 a. c. (27%), 24 d. q. (38%). Of 146 in second stage, 4 a. c. (2.7%), 39 d. q. 26%).

NEW MEXICO.

31. FORT BAYARD.—U. S. Army Hospital (Lt. Col. G. E. Bushnell, Commander). Report for 1909. New buildings nearly completed. Of the total number, 431 patients, 70 in first stage, 16 a. c. (22.8%), 41 d. q. (58.5%); 247 in second stage, 21 a. c. (8.5%), 5 d. q. (2%). 232 patients remained six months or longer. Of 43 in first stage, 13 a. c. (30%), 5 d. q. (11.6%). Of 137 in second stage, 21 a. c. (15%), 7 d. q. (5%).

32. FORT STANTON.—Sanatorium for Consumptive Seamen, U. S. Navy. Report for one year ending June 30, 1909. There are in all 97 tents, in which 194 patients can sleep. 205 admitted, 188 discharged; 2 cured, 26 a. c. (13.8%), 37 d. q. (20%). Report ending June 30, 1910. 149 admitted, 206 discharged; 41 a. c. (20%), 51 d. q. (24%). A number were treated with autovaccines with apparently good results.

COLORADO.

33. COLORADO SPRINGS.—Union Printers' Home. May 31, 1909-10. 49 patients with tuberculosis, of whom 37, after a stay of two to three months, were again able to work.

34. COLORADO SPRINGS.—Modern Woodmen of America Sanatorium. (J. E. White.) Opened December, 1908. Report

up to April 1, 1910. 1,000 acres near the city. Supported by the Modern Woodmen of America. Admits only members of that order whose cases are not too far advanced. Every patient has his own cottage. Of 174 patients, 136 remained over three months, 36 a. c. (26%), 39 d. q. 28%).

35. DENVER.—National Jewish Hospital for Consumptives. Tenth annual report, May 1, 1909-10. Very thorough, detailed medical report. 257 patients discharged, remaining on an average six months; 60 d. q. (23%), 53 much improved (21%). Of 121 in first stage 55 a. c. (45%), 28 d. q. (26%). The history of each patient is given, complications involving the eyes, ears and throat, blood examinations, diagnosis by means of agglutination, Wassermann reaction, opsonins, results with B. E., B. F., etc.

36. EDGEWATER.—Evangelical Lutheran Sanatorium. Report pril 30, 1909-10, 98 patients treated; average length of stay, 190 days; 55 improved (56.6%). Of 63 patients in advanced stage, 30 improved (47.6%).

37. EDGEWATER.—Sanatorium of the Jewish Consumptives' Relief Society. Sixth annual report, 1909. The New York Woman's Aid Society erected a new pavilion, capacity now 110. Of 138 regular patients, 99 improved. Report of each case.

CALIFORNIA.

38. LOS ANGELES.—Barlow Sanatorium. Seventh annual report, September 1, 1909-10. During the year a building for social purposes and one for female employees were erected. Of 65 patients discharged, 7 in first stage, 27 in second stage, 7 a. c. (10.7%), 5 d. q. (7.6%), 26 improved (40%). Histories according to Turban.

SOCIETY PROCEEDINGS.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

SEVENTEENTH ANNUAL MEETING.

ATLANTIC CITY, JUNE 1, 2 AND 3, 1911.

(*Continued from September Number.*)

FRIDAY, JUNE 2, 1911.

SYMPOSIUM—DISEASES OF THE SALIVARY GLANDS.

XI. The Teaching of Otolaryngology in Undergraduate and Postgraduate Medical Schools.

DR. S. MACCUEN SMITH, Philadelphia. The object of medical instruction to the undergraduate should be the development of a well-rounded general medical education, and although the teaching of specialties embraces a very important part of this comprehensive plan, we should clearly differentiate between the instruction necessary for the undergraduate and that necessary for the proper equipment of the postgraduate.

The author presented four reports of the methods of teaching otolaryngology to the undergraduates in sixteen institutions in the United States and two in Canada. In the majority of these medical schools didactic lectures have been virtually abandoned, the instruction being almost wholly clinical. The greater number also confine their teaching to the fourth year. In the two Canadian schools, which have a five year course, the subjects are taught in both fourth and fifth years. Only seven schools made the definite statement that final examinations are required in these branches, although the various reports would indicate that an examina-

tion, if not held by the respective Chairs, is included in the general examination in medicine and surgery in the remainder.

It appears further that the undergraduate is very much better taught, for his purpose, than the postgraduate. Apparently much remains to be accomplished in postgraduate teaching, both as to methods and system, as well as a more comprehensive classification of students and their needs. The shortcomings in postgraduate instruction are emphasized in one communication, the author of which said: "Postgraduate teaching in America is very unsatisfactory."

DISCUSSION.

DR. JOSEPH H. ABRAHAM, New York, confined his remarks chiefly to postgraduate work. In undergraduate schools the teaching of normal anatomy of the nasal cavity is very deficient. In the teaching in postgraduate schools certain difficulties might be enumerated. First, the average student comes to take a special or general course, the length of which is usually about three months. Second, he desires to see the professor operate, and does not care to listen to didactic lectures. Third, the minute anatomy of the upper respiratory tract is practically unknown to him. Fourth, histology is almost entirely unknown to him. Furthermore, physicians come to prepare themselves for a specialty who are not able to handle instruments for examinations, especially the head mirrors, the rhinoscopic and laryngeal mirrors. They cannot make a rhinoscopic examination.

The course which the speaker endeavors to give is first operative upon the cadaver, the classes being limited to four students. This costs fifty dollars, which they seem to consider expensive. Six bodies are used in the course. Eight lectures, of about an hour and a half each, are given with this part of the work. Before this operative work is given the gross anatomy is demonstrated upon various cut sections. The majority of students consider this course too high and do not take it.

After the anatomy lessons are finished the clinical work is taken up. The histories of the patients are carefully gone over, the various pathologic lesions pointed out, and the diagnosis made. This does not seem to attract the students.

At this stage of the instruction as few operations as possible are shown, as they are not prepared to benefit by them. The histology and pathology should, in the meantime, be given in a special course.

The students are then given patients to treat. The deficiency in ability to handle instruments is now discovered. Many of the men cannot examine the nose or larynx, they cannot even control a head light. After they have mastered the method of examination, the handling of the instruments and the diagnosis, they are then given minor operations. The chief aim of most of them is to do a submucous operation, and to remove adenoids and tonsils.

Dr. Wendell C. Phillips, New York, said it is a matter of pride and congratulation that a deceased member of this society, Dr. D. B. St. John Roosa, became the founder of postgraduate medical education in America. Dr. Roosa did more for the advancement of postgraduate work than any other single member of the profession in this country.

In a private conversation with Dr. Knowles, on the journey down, the latter regretted the use of the term "postgraduate;" the speaker agreed with him. It should be called advanced medical education.

Teachers in postgraduate institutions have to deal with two general types of practitioners: First, those who feel the need of higher medical instruction in order to be able the better to conduct their own work as general practitioners. Second, those who desire to lay the foundation for specializing in the various branches of medicine and surgery. The two classes of practitioners require different teaching. The postgraduate institution should meet this demand. At the New York Postgraduate Medical School and Hospital this demand has been met. In the department of otology and rhinology the general practitioner is permitted to attend the clinical lectures of the teachers, and all operations and demonstrations, and are encouraged to examine all cases and to draw upon charts their findings.

With especial reference to otology, his branch, Dr. Phillips spoke of the deplorable ignorance of the average medical man, despite the fact that an unusually high order of physicians attend the courses. Very few of them have ever seen a drum membrane with reflected light. The majority of them

are very glad to overcome this deficiency, and welcome the practical instruction which they receive. He laid great stress upon the teaching of otoscopy, first showing the normal drum membrane, with its landmarks, etc. When the student has learned this, he is then taught the pathologic conditions, after which he is allowed to witness operations. This course is covered in from three to six months.

Dr. Phillips hoped he would never hear again that it is the aim of postgraduate schools in this country to send out specialists after from six weeks' to three months' instruction. Only recently he had heard a clinical professor in an undergraduate institution make this criticism in an after-dinner speech at a medical dinner. He thus showed his ignorance of the facts. In the above school these special students are distinctly told that they should not attempt to practice without giving from one to two years to prepare for it. The number of men who come prepared to devote a year or more to such special duty is increasing year by year.

He had become convinced that in both undergraduate and postgraduate schools the tendency is to swing too far away from didactic teaching. He considered this a mistake, and in his work at the Postgraduate he gives each year a few didactic lectures on the diseases of the ear.

The gross and minute anatomy, physiology, pathology and histology of the ear are taught in special courses, and these are taken by the majority of the students.

They are also given a special course in the operative surgery of the ear, a course which the speaker had the honor of founding in the above named school. Each student performs the entire list of operations on the cadaver.

It is the custom in the Postgraduate School, after a man has taken all these courses and has witnessed all the operations, to permit him to operate upon the living subject under the immediate supervision of a professor. For this a special fee is charged. Courses on the living are also given in other departments of the school. It is very encouraging to the practitioners throughout the country to know that they can receive this kind of instruction.

In order to accomplish the work just outlined, the proper hospital equipment is necessary. In no country are there better hospital facilities than in America. At the Postgrad-

uate and at the Polyclinic there is ample provision for the work. The Polyclinic is building a magnificent institution, and within three months the Postgraduate will have a hospital capacity of about four hundred beds, the hospital and school being all under one roof.

Dr. Phillips did not agree with the pessimistic remarks of Dr. Myles. The pride of otologists, and of all specialists, should be to make America a center for advanced medical instruction. This is sure to come, and American enterprise and devotion will accomplish it. We are already successful rivals of the best of European institutions.

He regretted that any postgraduate institution gives certificates unless upon examination. In the New York Postgraduate, certificates signed by the president and secretary, stating the exact instructions received, are given, but are not signed by the professors.

Dr. Charles P. Grayson, Philadelphia, confined his remarks chiefly to the teaching of laryngology in undergraduate schools. "Poeta nascitur, non fit" applies even more to the specialist than to the poet. He doubted the advisability of devoting more time to special work in laryngology in undergraduate institutions. The student receives instruction in this branch in his third year, during which time he is not only given a knowledge of the more common diseases of this region, but is made to realize the unavoidable limitations of the general practitioner. In other words, to know when his own ability ceases and when he should seek the assistance of the specialist. A good deal of danger results from teaching these young men enough to make them think they are specialists. He particularly warned his students against undertaking certain cases, which the short period of instruction cannot fit them for treating.

In an elective course the teacher should do some of the electing. He agreed with Dr. Dench that it is a waste of time on the part of the instructor, as well as the student, to try to teach those who have neither fitness nor liking for the work. In the first hour's instruction the teacher can discover whether a student has or has not any talent for special work. Some men can never learn to handle instruments skillfully, whereas others have a light and delicate touch from the beginning. It is useless to waste time with the former class.

Without adding to the time already allowed in the curriculum, students could be taught didactically in the third year sufficient to make them safe, if not accurate, diagnosticians, and in the fourth year they could be given all the clinical work which is necessary. Operative work should be confined to postgraduate institutions.

In conclusion, Dr. Grayson thought it much wiser to endeavor to discover and develop natural ability than to give exhaustive information which, failing of complete digestion, might often be misapplied.

Dr. Henry O. Reik, Baltimore, confined his remarks to the teaching of otology in undergraduate schools. He agreed with the views expressed by Dr. Grayson, and had expressed himself in similar terms in the preface to his "Manual for Students of Otology." No more time than now given should be spent in the instruction of these students, but more should be accomplished in the time already allotted. All that the public demands or expects to know is the essentials, the things which, as general practitioners, they should be prepared to meet. They should be equipped with that knowledge which best enables them to recognize diseases and to know when to call upon the specialist. If a student desires to become, or is fitted for becoming, a specialist, he should be given the practical points first, and then have these demonstrated clinically as far as possible.

The speaker had eliminated descriptions of operations from his course, teaching the recognition of the symptoms of the various diseases. Operations at Johns Hopkins Hospital are open to the students, who are invited to attend them, but this is in no sense a compulsory part of the course.

A very distinct line should be drawn between the work of the practitioner and the specialist. Doctors should be given a more comprehensive knowledge in the short time allotted to the specialties.

Dr. Max A. Goldstein, St. Louis, said it is evident that there is a wide difference of opinion as to how undergraduate students should be taught. He wished to emphasize very strongly the moral obligation of every teacher of otolaryngology to give to his pupil just as much as possible of the subject matter comprising the given specialty. The student, after three or four years in college, goes out to practice,

and he will do tonsil and adenoid operations, treat acute and chronic otitis media, etc., and he will not send these cases to the specialist. He will send the more extensive and difficult operations, such as the mastoid, to the specialist, but the others he will undertake himself. The moral responsibility, therefore, rests upon otolaryngologists as teachers to train the student in the diagnostic, therapeutic and operative work which is a part of his general practice.

Dr. Goldstein allows his senior students to operate under direct supervision, upon tonsils and adenoids, to incise drum membranes, etc., thus making them more definitely familiar with the instruments and more confident in themselves. He did not see why there should be an embargo placed upon operations which it is necessary for the undergraduate to perform as soon as he gets out in practice. If a man goes to a postgraduate school without knowing how the drum membrane looks, it is the fault of the teachers in the undergraduate school.

Dr. J. A. Stucky, Lexington, spoke in behalf of the men who take postgraduate instruction, either in Europe or America, or both. It is well for Americans to hear the criticisms of these fellow-Americans. The men to whom he referred are no ordinary individuals, but doctors who are graduates of the best schools in America, and who have taken postgraduate courses after having practiced medicine for several years. These men say that Americans are too superficial, in too big a hurry, and that they attempt to teach more than students, as general practitioners, can utilize. The instruction, furthermore, is veiled in so much of mystery that the students are confounded. He spoke especially of three men who are doing splendid work. What they wanted, and what the average doctor wants, is enough to advise a patient what to do. The speaker was not convinced that the average man who takes a postgraduate course does so with the idea of developing into a specialist. If so, this idea should be discouraged, but the diagnostic part of the eye, ear, nose and throat work should be emphasized. He had seen several men holding postgraduate certificates attempt to remove turbinates, with serious results. Certificates which grant the legal right to practice a specialty should not be carelessly granted.

XII. The Method of Giving Anesthesia in Operations Upon the Upper Respiratory Tract.*

By James T. Gwathmey, M. D.,

New York.

DISCUSSION.

Dr. Francis R. Packard, Philadelphia, confined his remarks to a brief outline of the method employed at the Pennsylvania Hospital in Philadelphia, which is very generally employed in the hospitals throughout the city.

The vast majority prefer ether as the anesthetic agent, in combination with some other drug, usually ethylchlorid. The anesthesia is begun with ethylchlorid and switched to ether, with Dr. Gwathmey's or some other similar apparatus. He had used the Rupert apparatus.

The anesthetic is given by a trained woman anesthetist. The position which he prefers, and which most of his colleagues prefer, is the recumbent, with a sand pillow under the head and shoulders. The secret of the anesthetic depends upon the skill of the anesthetist, who gives most successfully the agent to which he is most accustomed. The old method in most hospitals was to have the resident interne give the anesthetic, a custom which was responsible for more disasters than is generally realized. The giving of an anesthetic to a patient about to be operated upon for the removal of tonsils or adenoids is too serious to be entrusted to one just out of college.

Disasters in the giving of anesthetics often occur as the result of the improper preparation of the patient before the operation. He cited two cases in his own practice which illustrated this point; the patients having each of them eaten a full meal, nearly asphyxiated during their anesthesias.

Dr. Joseph A. White, Richmond, said the choice in anesthetics is generally given to chloroform in the South, though there is now a tendency to give ether or ether mixed with chloroform, as suggested by Dr. Gwathmey. This is more especially the case since the old cumbersome methods of giving ether have been discarded. Probably we do not

*See page 841.

credit the anesthetic with all the fatalities that might be traced to this source. Deaths occurring four or five days after the operation are usually attributed to the operation, or to the patient's inability to recuperate, whereas many such cases are directly caused by the effects produced upon the patient's system by the anesthetic, and, therefore, should be attributed to the anesthetic.

In doing operations about the face and mouth it is desirable to eliminate all apparatus, as well as the anesthetic. In such cases rectal anesthesia is advantageous, and should come more into favor than it is at present. The anesthesia is begun by mouth and continued by the rectum. Notwithstanding the fact that the anesthetist cannot watch the reflexes, it is not as dangerous as pulmonary anesthesia. Moreover, there is no necessity of any complicated apparatus, an ordinary wide mouthed bottle with a cork in which are two holes, with two glass tubes bent at right angles, to one of which a small hand ball is attached, and to the other the rectal tube. This is half filled with ether and placed in a vessel of hot water, because the vapor should be warm and the hot water makes it evaporate more readily. It is not necessary to put the rectal tube very far into the bowel, from four to six inches suffices. The anesthetist places one hand over the sigmoid flexure to keep track of the amount of tympanites, and uses the other to force the vapor into the bowel. If the abdomen should become too much distended, it is only necessary to separate the rectal tube from the bottle, and by pressure upon the abdomen, the gas is allowed to escape, and the tube is then reconnected. The preparation of the patient beforehand consists in giving a brisk purge the day before, and two high soap enemata two hours before the operation. If there is much gas a soda enema might be given. To get rid of the peristaltic action a small dose of morphin or hyoscin may be given.

Dr. J. A. Stucky, Lexington, emphasized the importance of the point Dr. Gwathmey made with reference to the quantity of the anesthetic used in the mastoid operation. The majority of operators had been in the habit of using perhaps four or five times as much as is necessary. After the first stage of the operation practically no anesthetic is required. In doing the radical mastoid operation, if the surgeon will clean out the middle ear first, instead of last, it will be possi-

ble to decrease the quantity of anesthetic one-half. Many slow recoveries and much of the socalled shock is due to improperly conducted anesthesia.

Rectal anesthesia undoubtedly has a place in surgery, but the esthetic objection to the method must be overcome. It is not necessary to introduce the tube so far, four or five inches being sufficient. He had found morphin and hyoscin beneficial in a number of cases.

DR. GWATHMEY, in closing the discussion, said the surgeon who insists upon the use of any particular anesthetic, no matter what it may be, more or less handicaps the patient. In many cases contingencies are apt to arise which neither the surgeon nor the anesthetist can anticipate, and the anesthetic must be varied in whatever manner the exigencies of the case may demand.

Referring to the use of chloroform in the South, Dr. Gwathmey called attention to the fact that he was one of the first to show that chloroform is safer in the South than in the North, and to establish the reason for this by laboratory experimentation. He had found that it requires twice as much warm chloroform to kill an animal as it takes of cold chloroform to accomplish the same end. In giving chloroform warm the vapor tension is decreased, making it almost impossible to give an overdose. The warm vapor is inhaled and exhaled with greater rapidity than is the cold vapor. For this reason it is safer to give chloroform in a warm climate than in a cold, and in the summer than in the winter.

He considered Sutton's apparatus for giving rectal anesthesia the best. It has a mercurial manometer attached, and so arranged that if the tension goes beyond a certain point a valve lets out the surplus gas, making it impossible to get overdistension. The apparatus is also supplied with a thermometer for regulating the temperature of the ether. The ether should go in at a temperature of 98° or 99°, and no higher.

If water is not available for the suction apparatus, the electrical pump may be used, but the speaker preferred the water pump, because it is simple and does not get out of order. Air suction is preferable to either water or electricity.

SYMPOSIUM—ATYPICAL MASTOIDITIS.

XIII.

Dr. Eugene A. Crockett, Boston. Atypical mastoid disease is not only far more common than is ordinaryily supposed, but its early recognition is very important on account of the fact that the intracranial complications of acute mastoid infection are more common is this variety of mastoid disease than in any other. The same may be said of thrombosis of the lateral sinus and of general septicemia.

Atypical disease of the mastoid process occurs by reason of an abnormal type of mastoid bone rather than from any other etiologic factor. It will be seen just as commonly after a simple influenza infection as it will be after a pneumococcus infection, or scarlet fever, typhoid fever, etc. In all cases where mastoid disease is suspected and cannot be proved, it is well to remember that a carefully taken X-ray picture of the mastoid furnishes an absolutely correct means of determining what process is present in the temporal bone. It should also be remembered that such a process may be quite devoid of local or general symptoms sufficiently severe for diagnostic purposes, particularly that it may exist in cases in which there is only an indefinite history of discharge from the ear and which present a normal drum membrane and canal wall. These are the cases of socalled primary mastoiditis. The presence of swelling of the posterior-superior canal wall is one of the most diagnostic single symptoms of mastoid disease, and when present is of decided importance in making a definite diagnosis.

XIV.

Dr. James A. Stucky, Lexington. Certain anatomic conditions favor the development of atypical or symptomless mastoiditis. Heine described these as cases: (a) In which a thickened tympanic membrane resisted the suppurative process, and pus broke through the annular ligament of the stapes, infecting the labyrinth, from which purulent meningitis resulted, ending in death. (b) In which there is a large aditus ad antrum and the mastoid cells are situated exteriorly to the lateral sinus. (c) In which there is a diploic

mastoid process with a medium sized antrum and large cells extending into the root of the zygoma. (d) In which there is a very thick or sclerosed cortex.

The author's experience accorded with that of Barnhill, Heine and others. (1) That suppuration may take place in the mastoid antrum, mastoid cells, or both, and may even be complicated by intracranial abscess, without the drum membrane even having ruptured, and consequently without the ear having discharged. (2) That mastoid abscess without any of its complications may occur, or at least assume a form of dangerous activity months or years after a suppurating ear has apparently healed; at least after the perforation in the drum membrane has healed and all external discharge has ceased. In such cases some infective focus of pus has remained latent in the structure of the temporal bone. A case in point was cited.

Atypical mastoiditis is most frequently met in the exanthematous diseases, diabetes, typhoid fever, pneumonia and influenza.

Often a diagnosis can be made only by exclusion. The special value in these cases of frequent differential blood count, percussion and transillumination of the mastoid process was emphasized. When in doubt, however, the mastoid should be explored. The present knowledge of the disease and the perfection of technic in operation does not justify one, in the face of the elements of uncertainty and possible dangers, in preserving a hesitating attitude in doubtful cases.

XV.

DR. THOMAS J. HARRIS, New York. The first mastoid operation was performed in this country in 1864. For a long time the operation was resorted to with great hesitancy, and under no exact indications. Gradually, with the acquirement of a more accurate knowledge of the anatomy and pathology of the temporal bone, the mastoid operation acquired a well recognized place in surgery. Unfortunately, when the indications for its performance were thought to be well established, cases began to be reported which did not conform to the classical symptomatology. This number has greatly increased during the last twenty years. No attempt, however, has been made toward a systematic grouping of

these cases, or a consideration of them as a whole. It has seemed fitting, therefore, to make such an attempt.

The term atypical mastoiditis is applied to inflammation of the mastoid without perforation of the drum membrane. Cases of this character may be considered under the following heads: (1) Primary mastoiditis—an inflammatory process beginning in the mastoid bone without previous involvement of the middle ear. (2) Latent mastoiditis—where the infection of the mastoid has proceeded from the middle ear, the involvement of the latter not being sufficient to cause rupture of the drum membrane, or, in some cases, even to produce any changes in its appearance. (3) Hysterical mastoiditis, or mastoidalgia—which occurs chiefly in females, first, without associated disease of the ear; second, in the presence of acute inflammation of the middle ear; third, where an inflammation, suppurative or otherwise, of the middle ear has previously existed. (4) Condensing or sclerosing mastoiditis—formerly regarded as a distinct entity, but now believed to be identical, in the main, with mastoidalgia, a pseudomastoiditis, in no sense a true entity. (5) Syphilitic mastoiditis—a rare form, occurring in syphilitic patients, in which, with a normal ear drum, there is excessive tenderness over the mastoid process, with a history of discharge from the ear.

DISCUSSION.

Dr. Frank Allport, Chicago, said that he had seen so many cases of atypical mastoid disease that he sometimes wondered if there were any really typical cases. One of the most interesting and important points suggested by this series of papers is the frequency with which one encounters cases of mastoiditis which present very few of those characteristic symptoms which we are led to believe are dependable operative signs. He refers to those cases in which there is no drooping of the meatal wall, no mastoid tenderness, no swelling, no temperature, and in which the blood count is not significant.

He has not had much experience with X-ray diagnosis, but believes that it holds great promise for the future, as soon as better pictures are made and we acquire the ability to interpret the significance of such pictures.

As a rule, diagnosis must be made from the general picture presented by the patient, everything being taken into consid-

eration; and it should always be borne in mind, as Dr. Stucky has so aptly stated, that one cannot afford to maintain a hesitating policy. He had never seen a case harmed by a simple mastoid operation, but he had seen many lamentable results follow the tardy performance of the operation.

He did not know what Dr. Stucky meant by exploratory operation. He did not see how one could very well explore the mastoid cavity without performing an actual mastoid operation. He presumed that Dr. Stucky meant that the operation should be performed along classical lines and then the interior of the bone examined in the search for pathologic conditions. He remembered a case reported by him some years ago, in which the patient complained of sudden and severe pain in the mastoid bone. The physician requested that the mastoid be opened, but Dr. Allport could not see his way clear to the performance of the operation at that time. He believed it to be a case of neuralgia and advised treatment therefor. There was no swelling over the mastoid, no tenderness, no drooping of the meatal wall, no perforation of the drumhead, a perfectly normal appearing drumhead, there was no temperature and the blood count was not significant. Nevertheless, the patient passed a miserable summer, and finally returned again in the fall with request from the family physician that the mastoid be opened. Dr. Allport reluctantly consented to open the mastoid, and declared that he had never seen a more destructive process than in this case. Whether it was a case of primary mastoiditis or not, he did not know. In fact, he could not say positively from his own experience that there were any real cases of primary mastoiditis, although he presumed from the writings of other men that such cases must exist. This patient positively asserted that she had never in her life had earache or discharge from the ear, and the appearance of her drumhead certainly bore out this statement.

Dr. Allport cited another case of what appeared to be primary mastoiditis in a child six months of age. There was no discernible signs of middle ear disease and no history of such a disease, and yet the child had a distinct mastoiditis. Still he felt that possibly a middle ear abscess might have existed for a few days, and the parents, who were ignorant, might not have noticed it.

Dr. Allport was inclined to think that the cases of mastoidalgia, mentioned by Dr. Harris, were very rare. He remembered seeing such a case a year or so ago in the person of an old maid of neurotic disposition, who consulted him for intense pain in the mastoid process. This was the only symptom she had. The mastoid bone was opened for relief of the pain. No disease was found, but the bone was extremely sclerotic. The operation effected a cure. Whether there was nerve compression caused by the sclerosed bone, he did not know, but in all events the patient was cured by the operation and has not complained since. He believes that one is justified in opening the mastoid in cases of persistent pain in that region, even in the absence of other symptoms, as no harm can come from a properly performed mastoid operation.

Dr. George A. Leland, Boston, had been much interested in the papers of the symposium, but particularly in Dr. Harris' classification of cases of atypical mastoiditis. It had seemed to him, however, that it is impossible to classify them very definitely and distinctly, because they are of such infinite variety. To paraphrase a recent light opera song, he had never seen two mastoids alike, nor ever seen one alike twice. As knowledge increases, however, it is probable that the classifications will be modified, because the diagnosis will be made before the mastoid becomes really what is now considered typical. During the past few years in the City Hospital, in order to save time, both for the hospital and the patient, and for the sake of the hearing, early operations have been done, not waiting for typical classical symptoms, and hence, as it is natural to suppose, the early symptoms would present a variety which it would be difficult to put in strict classes. Hence, a very large majority of them would not be classified as typical according to our definition of today. It seems to him that mastoid cases can be put into two large groups: those in which the symptoms, edema or inflammatory swelling, or pain with tenderness and projection of the auricle, might be considered the obvious group; and in which none of these symptoms are present, but in which the discharge is greater than could possibly come from the small tympanic cavity; and in which the drumhead refuses to heal and is accompanied by more or less swelling of the flaccid part, together

with that of the periphery, which would be equally typical but not obvious; and which might also be called typical. These are cases where valuable time is lost because the general practitioner, or perhaps the conservative specialist, has to wait for obvious signs. Special attention should be called to this type by men of such an assembly as this, so that they may be continually brought to the attention of the general practitioner. This latter variety does not include those of the Bezold type, in which the swelling is on the inside, and equally obvious from its own peculiar symptoms of headache, stiffness of the jaw and neck, and deep tenderness around the tip.

The symptoms mentioned by Dr. Crockett and others, of a discharge too profuse to be attributed to the tympanum alone, has long been a guiding symptom in our hospital. If the discharge is copious enough to run from the canal and stain the pillow, especially at night, or to necessitate frequent changing of cotton wicks, it is evident that it must come from the antrum or some of the contiguous cells. If the walls at the periphery of the drumhead are prolapsed, with a scanty discharge, without pain or temperature, it may mean that the mastoid is involved or may not. These cases require constant watching and careful observation, so as to be sure of a definite diagnosis, especially in absence of all the classical symptoms.

There is one symptom which I have not seen mentioned, and that is transient pain coming in the middle of the night for a short time only. The first night perhaps for fifteen minutes, about eleven o'clock or perhaps up to one o'clock, when the discharge is more or less copious. The next night or so it may last for half an hour, and if allowed to go on it may increase up to two or three hours. This nocturnal pain I have found in a great majority of cases to mean that the mastoid operation will be inevitable sooner or later, and it can usually be depended upon to drive the reluctant patient to accept operation. I have found the mastoid always to be involved in these cases, but if it is opened early there may be scarcely any evidence of true pus, except by microscopic examination, and if opened later there may be only one or a few separate foci at the purulent breaking point.

Elevation of temperature is by no means always present, even with the mastoid full of pus, and when present means

absorption, so that the frequent remark of the general practitioner, that there can be no trouble because of no temperature, shows that he is not conversant with this fact. The rule lately laid down by Uchermann, although not specially new, is a good one to follow, namely, that in acute suppurative otitis media, if temperature lasts up to the eighth day, despite frequent paracentesis, the mastoid should be opened, even in the absence of tenderness over the process, or other classical symptoms.

Dr. Leland cited the case of a lady who had a thickened perforated drumhead with profuse discharge, with red, slightly swollen periphery, who was not confined to the house, but who had been treated for two years for the relief of the discharge without effect. Classical symptoms were entirely absent, although pressure elicited slight pain. This, however, is not conclusive, because deep pressure over the normal mastoid will sometimes cause pain. Finally, in order to get rid of the discharge, operation was submitted to. The outer cortex was found to be about a quarter of an inch thick, hard and white, but the inner table was destroyed over an area as large as a quarter of a dollar, and granulations covered the dura and sinus, a large area of the inner cortex being absent. There were the socalled protective granulations which saved the patient from extension inward.

This condition of affairs may be found, even in acute cases. In another recent case, a man of about thirty-five years of age had had measles two months before, but came into the hospital complaining of slight pain, especially at night, and slight discharge. There were no other external symptoms. Upon operation the mastoid was filled with much thickened granulations, which caused extensive absorption of the trabeculæ, more or less complete, and the inner cortex was largely absent. It seemed strange that this should have taken place in two months, although it only emphasizes the destruction which may sometimes occur as a sequel of measles.

Dr. Leland has not had much success with the X-ray, perhaps because his experience has been limited or unfortunate.

He congratulated Dr. Crockett upon his first case as detailed. We can all appreciate the immense satisfaction such marked success with a difficult diagnosis and favorable result brings.

He did not agree with Dr. Crockett that leucocytosis is a late symptom. It is sometimes noted early in the disease. He cited a recent case in which acute epidemic tonsillitis was accompanied by acute middle ear disease. Multiple incisions were made in the drumhead on two different occasions, after each of which the temperature subsided. There was no redness nor swelling nor tenderness over the mastoid process, the only sign of mastoid involvement being that the discharge would not cease, nor the drumhead heal. Temperature began to rise with the drumhead well open. Case began April 29th. First paracentesis was made May 3d, with relief of all aural symptoms, except considerable serous discharge. On May 12th, slight increase of temperature, and 14,000 white blood corpuscles. On the 15th, slight pain on pressure on the mastoid, but no other symptoms. Paracentesis gave no relief. On the 16th the temperature rose to the vicinity of 103°. Pain appeared, and tenderness in the left ankle, and at about six-hour intervals were involved the left knee, then the right ankle, the right knee, and the left wrist, the right wrist, the right elbow, and the left elbow, together with slight pains in both hips and shoulders, with temperature of about 104°. Blood culture was negative. Discharge from ear showed streptococcus, and from the throat strepto- and pneumococcus.

This was a very pretty case of acute articular rheumatism. The tonsils had been burned down to stumps in the city of New York, one, however, having a slight amount of cheesy detritus only. It was concluded that the mastoid was the only source of infection. The blood count showing 14,000 whites with 83 per cent of polymorphonuclears. On the 18th the mastoid was opened, and although no distinct pus was observed, the culture showed streptococcus, staphylococcus and pneumococcus, with microscopic evidence of necrotic bone. The inner cortex was somewhat softened, the sinus wall slightly opaque and smeared with a thin exudate, easily wiped off. The sinus was opened and the flow very free; plugged above, there was copious bleeding from below, and plugged below, only slightly greater flow from above. On the next day the joints began to subside, and on the 20th, although the whites were still 14,000, the polymorphonuclears had diminished to 79 per cent, and the case went on to rapid recovery

without incident. For this case and some of the notes he is indebted to Dr. A. K. Paine. It might be observed that here we had to do with a case of bacteremia rather than septicemia. Blood culture and counts were by Dr. G. P. Sanborn.

Mastoidalgia has been mentioned by Dr. Harris, and he would like to call attention to the fact that in these cases sometimes is found a large swollen and inflamed condition of the posterior pharyngeal lymphatic band running up behind the posterior faucial pillar. In this case there is also apt to be pulsating, low toned tinnitus, when it will be found that this swelling involves also the region of the eustachian tube, usually without involvement of the ear or diminution of hearing. Strong astringents applied to this band will usually clear up the symptoms.

Dr. Leland congratulated the society on the excellence of the papers presented, and hoped that they would call attention to obscure forms of mastoid disease which may lead to dangerous complications, so that backed by the weight of the opinion of this society, so many of these cases may not be allowed to go on to dangerous or fatal complications.

Dr. Ewing W. Day, Pittsburg, said the fact that no symptoms are present at the time when the patient is examined does not signify that there were none previously. If it were possible to follow a case from the beginning, symptoms would probably be found at some time in the course of the disease. In this class of cases, when the mastoid is opened the disease is found to have extended to the dura. The very fact that it has extended to the dura accounts for the absence of pressure and symptoms at the time the patient presents himself. These are the most dangerous cases.

He had never been able to derive any information from the blood count in mastoiditis limited to the bone. The effect upon the blood stream from bone absorption is almost nil in such cases, and when the blood stream is affected the disease has progressed beyond the mastoid.

He had had X-ray pictures made in several cases, and whether it was the fault of the plates or of his inability to read them, he did not know, but they had been of no assistance to him.

Dr. S. J. Kopetzky, New York, held that in classifying these cases as atypical mastoiditis, if one excludes those so

classed because of a strictly anatomic basis, and considers the rest of these cases from the clinical standpoint, that then one will find symptoms commonly present in each group and significant for each clinical group. For example, the atypical mastoiditis caused by an infection of the pneumococcus, shows an invasion which subsides in one portion of the invaded area only to light up later in another section. The middle ear may be entirely normal by the time the lesion is evident in the mastoid process proper. This is atypical of the general run of a mastoiditis, but it is typical enough for a pneumococcus invasion of the middle ear spaces. Other examples of groups of cases acting alike under similar conditions of infection might be cited to substantiate this contention.

Regarding the case cited by Dr. Barnhill, the character of the invading organism is not given, and so one cannot say whether or not the case presented data characteristic of a class to which it might have been found to belong.

In regard to the cases of socalled "latent mastoiditis," it would be of moment to study what takes place in the cases of mastoiditis in which resolutions occurs. Dr. Barnhill says his case was one of latent mastoiditis of seven years' standing. The speaker doubts the latency of the disease for such a period, and called attention to the following: In the first place, in cases clinically nothing more than purulent otitis media, it has been observed that the cells in the mastoid process are filled to a lesser or greater extent with pus. This is so even when there are absolutely no signs of mastoiditis present. Furthermore, in cases of fully developed mastoiditis giving classical symptoms, and in which resolution takes place (as it often does), the tympanic cavity eventually becomes dry, the drum healing. The changes taking place within the cortex are of moment in this discussion. The bony intercellular walls which are in part destroyed are not reformed. The disintegrated mass becomes partly absorbed and mostly organized by the growth of blood vessels and connective tissue. The case is then cured, and the patient cannot be said to have latent mastoiditis. In this given case the patient is in a similar status to the one upon whom a simple mastoidectomy had been performed and the wound in the mastoid process had become filled up with granulation tissue and the skin and periosteum had grown over and covered

the wound area. An invasion by microorganisms, seven years later, might in all the above examples, or in any one of the incidences, set up an acute infection of the middle ear spaces and produce a profound disintegration of the granulation connective tissue in the mastoid process. In the resolved case it is no more the manifest stage of a long drawn out latent mastoiditis than it is in the breaking down of the wound area in the case operated in. To the speaker's mind the latency of Dr. Barnhill's case bespeaks resolution, and seven years later there was an acute infection with resultant acute mastoiditis.

Dr. Kopetzky did not believe that suggestion had so much to do with affording the relief where operation was undertaken in cases of mastoidalgia, nor did he believe mastoidalgia to come within the classification of atypical mastoiditis. He thought the relief was obtained because the nerves in the periosteum were severed during the operation, and suggested that in such cases operative procedures might be limited to incision and retraction of the periosteum where there was no pus in the mastoid process.

Dr. Kopetzky, replying to Dr. Beck, said that since Dr. Beck questioned his statements, he took the liberty of placing the factors upon which they were based before the meeting.

That pus invades all the cells of the mastoid process in cases which we are habitually diagnosing as acute otitis media purulenta from the clinical standpoint, is borne out by the investigations of Politzer and Bezold, and especially by the work of Boenninghaus. Radiograms of such cases which give no mastoid symptoms at all, and which are in no sense to be considered as mastoid cases, show, when compared with radiograms of the opposite ear, the distinct general cloudiness which, correctly interpreted, means pus within the cells. In the other cases, according to Bezold, in 9 per cent of the cases the bone of the mastoid process becomes involved in a destructive process which Boenninghaus has termed an "ostitis rareficans simplex."

The destruction of the walls separating the cells within the mastoid process, and the changes which occur after resolution sets in, whereby the larger spaces caused by this bone absorption is filled in with granulation tissue, was described in 1904 by Scheibe.

Boenninghaus, citing Scheibe, states that while some bony deposits may follow in the usual way from osteoblasts, this is only a very limited process. The radiograms of acute mastoiditis, and the study of the pathologic findings on the operating table, further substantiate these observations and contentions.

Dr. Walter A. Wells, Washington, mentioned the case of a physician who was visiting another physician in Washington, and who had been having some indefinite trouble with his ear. Though the trouble had existed six weeks, there had never been any sign of suppuration, no pain, except at the commencement, no severe headache. He had been under the care of several physicians in New York and elsewhere, but no one had suggested a mastoid involvement. When the speaker first saw the patient there were beginning to appear symptoms over the mastoid process. He could hear only at ten or twelve inches a watch that ordinarily he could hear at thirty inches. As the drum membrane looked suspicious, paracentesis was made, but no pus appeared. In a day or two there was a little discharge, which proved to be staphylococcus, with a few chains of streptococcus. With the appearance of the discharge the edematous condition over the mastoid disappeared. The physician whom the patient was visiting discouraged operation. The speaker operated, however, and found the mastoid tip absolutely rotten. The cortex covering the antrum was very thick, but the entire tip was broken down completely. The patient had lost ten or fifteen pounds, and was extremely prostrated before operation. This prostration will often guide one to a considerable extent in deciding whether to operate.

Dr. Max A. Goldstein, St. Louis, said there had been many references to atypical cases in which there was a dearth of symptoms, and in which destruction proved to be extensive. He presumed that if these cases had been examined bacteriologically they would have been found to be tubercular. He had reported three cases in which tubercle bacilli were demonstrated in the pus and granulations. The bacillus tuberculosis, the bacillus mucosus, or some other slow-working bacillus, is undoubtedly present in that class of cases which are so atypical in variety.

Dr. Stucky, in closing the discussion, said he had seen two cases of atypical mastoiditis in children under two years of

age, in which there were absolutely no symptoms at all until the patient had convulsions. There was a little bulging behind the ear in one case, which, when opened, proved to be an epidural abscess.

He had reported one case of traumatic mastoiditis. He had also had tuberculous cases, in which there were tuberculous glands behind the ear, with no history of middle ear tissues.

The exploratory operation, which Dr. Allport did not understand, meant the same thing to the otologist who opens the mastoid as to the abdominal surgeon who opens the abdomen.

He would have been glad if Dr. Leland had accounted for the nocturnal pains to which he referred.

He did not agree with Dr. Day with reference to absorption. If the abscess is walled off there may be no absorption, but a blood count taken twice daily will give indication of trouble.

XVI. The Socalled Conservative Mastoid Operations, With a Description of the Technic of Heath, Bondy and Siebenmann.*

By George L. Richards, M. D.,

Fall River.

DISCUSSION.

Dr. W. Sohier Bryant, New York. We have heard discussed the technic and details of the modified radical operation with the preservation of the drum membrane and the ossicles, which has become almost universally identified with the name of Charles J. Heath, the English author, who is generally accredited with being its originator. It may be of some interest in this connection to know that to America, rather than to England, belongs the credit of priority in using and demonstrating this improved method of operating for chronic otorrhea. As early as November 28, 1905,[1] it was my privilege to present at the meeting of the New York Otological Society a case upon whom the operation had been successfully performed on July 27, 1905. An account of this operation appeared in the *Archives of Otology*, February, 1906, while Heath's[4] article was not published in *The Lancet* until August 11th of that year (1906). Heath's work was done in June, 1906, while mine dates back to 1905.

*See September number, page 578.

It was furthermore my pleasure to make two other presentations of the operation, both of which antedate any recorded work of Heath's:

(a) At the meeting of the New York Otological Society, January 23, 1906.[2]

(b) At the meeting of the Section on Otology, New York Academy of Medicine, April 12, 1906.[3]

I want to distinguish between the conservative radical and the modified radical mastoid operation. In the conservative radical the ordinary Schwartze-Stacke operation is carried as far as removing the ossicles and the tympanic membrane, but the inner tympanic wall is not curetted, nor is the eustachian tube closed. In the modified radical operation the ossicles and the drum membrane are retained. I performed a modified radical operation on September 14, 1904. The case was presented before the New York Academy of Medicine, Otological Section, on March 9, 1905, and appears in the *Archives of Otology*, Vol. xxxiv, No. 3, June, 1905.

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4. Heath, Charles J.—The Cure of Chronic Suppuration of the Middle Ear Without Removal of the Drum or Ossicles or the Loss of Hearing. *The Lancet*, London, August 11, 1906.

Dr. J. A. Stucky, Lexington, had performed the Heath operation three times and in each case had subsequently to do the radical operation. He did not believe that any results could be obtained from the Heath operation that could not be gotten from a thoroughly performed classical operation. He had examined some of Heath's patients from two months to

three years after operation. Two cases he had examined twice. In two the results were ideal; in the others the drum membrane was still soggy.

Dr. Frank Allport, Chicago, felt as Dr. Stucky, Dr. Barnhill and others do, that as a rule the Heath operation is merely a makeshift—it does not get at the seat of the trouble. He did not mean to say that there are not some cases which will be cured by the Heath operation, but the question is, is it a wise and proper surgical procedure in the vast majority of cases of chronic purulent otorrhea of an intractable nature? Almost all of these cases are accompanied by necrosis of the antrum, middle ear, ossicles, attic and usually the mastoid cells down to the tip. The Heath operation does not interfere with the attic, or the ossicles, or the tympanic walls, or the end mastoid cells. The operation practically merely consists in opening the antrum and thereafter depending upon irrigation and drainage to complete the cure. The operation, therefore, cannot appeal to one's surgical sense, and can only cure a few cases where operations of any kind are indicated. It may possibly be that this operation should be tried in exceptional cases, such as those mentioned by Dr. Beck, in which both ears are diseased, or in children where we can depend upon the natural resources of the body to go a long way towards the production of a favorable result. Even in those cases, however, the wisdom of the Heath operation is not by any means established. Its position seems to be getting less secure as time and experience outline the boundaries of its usefulness. Dr. Allport felt that, after all, if an operation is to be done at all, it is better to do thorough work, to get at the real seat of the trouble and to perform the classical radical mastoid operation.

Dr. Allport was interested to hear what Dr. Stucky had to say about his ossiculectomies. He remembered that some years ago Dr. Stucky spoke valiantly before this society in advocating ossiculectomy for chronic purulent otorrhea. He remembered that about a year ago Dr. Stucky, with his natural honesty, declared again in the halls of this society, that he had been compelled to subsequently supplement all of these ossiculectomies by the radical mastoid operation. Dr. Stucky also some years ago was quite warm in his praise of the Heath operation, and now he comes before us and admits that most of these operations have had to be reoperated by the radical

mastoid operation. Dr. Stucky is a good operator and an honest man, and I believe that if every one were as honest, the Heath operation by this time would be considered an unwise procedure and would be relegated to almost oblivion. The classical radical mastoid operation, in the speaker's opinion, is the operation, and all who try to escape it will be compelled, sooner or later, to return to it, unless some procedure which we know not of at the present time is discovered.

Referring to the flap, he said that he believed the simplest and the best one that can be made is the Panse L flap instead of the Panse T flap. In the Panse L flap the incision along the diameter of the meatus is made as close to the bottom of the meatus as possible, and all of the meatal tissue is thereby thrown into the upper flap, which is unquestionably the region where the transplantation of tissue is most desirable. This flap can be beautifully and simply made by using the meatal divulsors, which are for sale by Mueller, Hardy and others. By forcing the blades of the divulsors apart the meatus is put on the stretch, and the lower arm of the divulsors being used as a guide for the knife, the incision is easily and accurately made.

Dr. Arthur B. Duel, New York, had not had sufficient experience with the three operations under discussion to speak convincingly concerning them. They involve, however, several surgical principles which are interesting.

For a number of years practically all otologists considered a chronic discharging ear which had resisted the usual measures of cleanliness and hygiene as a menace to the patient, which should be operated upon in order to stop the discharge. The length of the time in which these measures should be employed before operation was resorted to varied, according to the views of the operator. All such patients were looked upon as being in a precarious condition. When the radical operation was suggested, and it became known that it would cure the majority of these cases, this was the procedure which was advised, and surgeons continued to operate, some with a technic of their own, others with the technic of someone else, and the variations in method were discussed as to their relative merits. Finally it was discovered that simpler process would cure the disease in a number of cases. Then came the discussion of ossiculectomy, and the comparison of the two

methods. They represented each a different class of cases,—one class which could be cured by ossiculectomy, and the other which could be cured only by radical operation. Naturally, in the cases which were cured without ossiculectomy the hearing was better than in those where this was resorted to.

There are many chronic suppurative cases in which there is no necessity for continuance of treatment by hygienic measures, and in such cases the radical operation should be advised. These are the cases of cholesteatomata, and where functional examination shows that there is fistula leading into the labyrinth, or where there is found to be decided necrosis or caries of the ossicles, internal wall of the antrum, or the aditus ad antrum. Other cases, with large central perforation, with profuse discharge, and with stoppage of drainage, can undoubtedly be cured by a less radical operation than exenteration of the middle ear, destruction of the ossicular chain, and loss of hearing. Experience had taught him more and more each year that many cases can be cured by drainage from the middle ear through a posterior operation, leaving the drum membrane and ossicles intact. Some method of posterior drainage, leaving these structures in place, would succeed in reducing the number of cases of radical operation one-half.

SATURDAY, JUNE 3D.

RECENT ADVANCES IN THE TREATMENT OF DISEASES OF THE EUSTACHIAN TUBE.

XVII. (a) The Pharyngeal Orifice of the Eustachian Tube, with a Demonstration of a Speculum and Other Instruments for the Direct Examination and Treatment Thereof.

DR. SIDNEY YANKAUER, New York, described his direct nasopharyngeal speculum and intratubal speculum. He first experimented with straight tubes, but finding that these caused injury to the soft palate, which was to be scrupulously avoided, he abandoned the straight tubes. After studying the mathematics of the situation, he devised the instrument which is described in the paper. The work of Gyerygai in the direct examination of the nasopharynx by means of straight tubes was reviewed.

The author's speculum is so constructed that the anterior

wall of that part of the instrument which enters the nasopharynx comes in line with the posterior wall of that part which presses against the angle of the mouth, so that it forms a lever having a thickness corresponding to the thickness of the meatal opening. The parts are therefore brought into view with the least possible amount of pressure on the soft palate, so that injury to this structure is entirely avoided.

Cocain is used for the first few introductions of the speculum, and in sensitive patients each time.

The patient sits upright in front of the operator. One side of the nasopharnyx is examined at a time. Attention was called to the difference in appearance and relationship of organs examined by the direct method and by means of reflecting instruments. The anatomic structures in the neighborhood of the pharyngeal orifice, and their behavior under physiologic and pathologic conditions, were discussed.

As the direction of the speculum corresponds to the direction of the axis of the tube, it becomes possible to insert straight instruments into the tube, for the purpose of investigation or treatment. If the interior be cocainized, it is possible to insert a short straight tube for about 1½ cm. into the eustachian tube. The intratubal speculum is used for this purpose.

Pathologic findings in and about the fossa of Rosenmüller were next discussed. Six cases were cited in which there was excessive secretion in the fossa of Rosenmüller. All patients complained of marked tinnitus aurium, but not of deafness. The proximity of the fossa of Rosenmüller to the carotid artery, to the isthmus of the eustachian tube, and to the labyrinthine capsule, led to the assumption that the head noises were due to the breaking of air bubbles or to the movement of the mucus within the fossa. The absence of inflammation in the fossa, and the absence of all evidence of middle ear disease, the drum membrane being normal and the eustachian tube patent in each case, further substantiated this view. The mucus was removed by the irrigation of the fossa, either through the speculum with a straight canula, or by means of the old-fashioned postnasal syringe. After the fossa was thoroughly cleansed out, an application of five or ten per cent solution of nitrate of silver was made to the fossa through the speculum. In four of the six cases the excessive secretion disappeared after a few treatments, given every other day.

With the disappearance of the secretion the head noises ceased completely. In two of these four cases relief was permanent. In the other two the patients returned several times with renewed secretion in the fossa. Relief was prompt and decided in the four cases, the tinnitus being markedly diminished after the first treatment. In the remaining two of the six cases cited, the secretion continued in spite of the treatment, and the tinnitus was not diminished.

XVIII. (b) Examination and Treatment of the Eustachian Tube by the Aid of the Nasopharyngoscope.*

By Edgar M. Holmes, M. D.,

Boston.

DISCUSSION.

Dr. W. Sohier Bryant, New York. I find that the old-fashioned, posterior rhinoscopic method of examining the mouth of the eustachian tube with the mirror is still useful in the majority of cases. As you know, however, at times this method is neither satisfactory nor practicable. A number of adaptations of the cystoscope have been described for exact nasopharyngoscopy and for use in cases where the mirror is unsatisfactory. The instruments are passed through the nose as Valentin's salpingoscope,[3] or through the mouth as Hays' pharyngoscope.[2] The Holmes model of the Valentin salpingoscope is the best I have seen.

I have found Hay's pharyngoscope serviceable in cases where obstruction of the nose prevents passage of the salpingoscope. The transnasal method has one great advantage over all methods via the mouth, in that it permits the inspection of the eustachian orifice in normal motion, which cannot be observed satisfactorily by the other methods.

von Gyergyai's[1] and Dr. Yankauer's instruments are based on quite a different mechanical principle and belong in another class. In cases where the palatal conformation is sufficiently ample to permit their use, they give direct access to the parts and consequently make easy manipulation possible.

*See September number, page 511.

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Dr. Bryant further said: While in the greater number of cases of middle ear disease, inspection of the pharyngeal mouth of the tube adds but little to the diagnosis, in the lesser number of cases such inspection is of considerable importance, because it reveals unsuspected conditions and fixes the details of previous assumptions. I have found such inspection especially advantageous in chronic obstruction of the eustachian tube, where the cause cannot well be determined without direct inspection of the orifice of the tube. The inspection enables us to determine the seat and nature of the fundamental cause of obstruction, whether in the tube itself, in the fossa of Rosenmüller, the mucous membrane surrounding the tube, the posterior ends of the turbinates, or the adenoid tissue. A doubtful diagnosis is made positive, and sometimes serious unsuspected conditions, such as the existence of malignant disease, are brought to light.

Here again, in the majority of cases, there is no need of knowing the exact conditions existing in the immediate neighborhood of the mouth of the tube, for our knowledge of the general conditions is sufficient to enable us to obtain satisfactory results from treatment. In the minority of cases, however, the local conditions differ from the general, and an inspection of the mouth of the tube enables us to determine the local change that is interfering with the function of the tube, thus putting us in a position to correct it. By means of the salpingoscope or the pharyngoscope, we can ensure the accuracy of local treatment—the application of reagents, operative

procedures, or catheterization of the tube. We are thus enabled to apply with the greatest benefit, fulguration or cauterization, to break adhesions and to remove redundant tissue.

Dr. Thomas J. Harris, New York, said the papers of Drs. Yankauer and Holmes represented some of the best work that has been done by the members of this society, the kind of work that the society stands for, namely, original work. It had been a revelation to him to realize how much can be seen by direct examination of the eustachian tube. He had also been surprised to learn of the variety of conditions which affect these parts, and of how much can be accomplished in the treatment thereof by means of direct inspection.

He asked Dr. Yankauer if the intractable cases to which he referred are really unmanageable, or if the difficulties which they present may be overcome by practice.

He would be glad if the gentlemen, in closing the discussion, would tell which is the better method, and what are the advantages of one method over the other.

Dr. Sidney Yankauer, New York, in closing the discussion, said he had never used enough pressure to injure the soft palate by the speculum. The amount of pressure used can be very easily gauged, and it is unnecessary to exert sufficient pressure to cause any traumatism. When he used the straight tubes, he had to pull the palate so much farther forward that he did sometimes injure it, but since he had been employing this speculum, this difficulty had been obviated.

Dr. Holmes' cases of acute otitis media were particularly interesting. He had attempted to treat such cases in a similar manner, making applications of cocain and adrenalin, and of argyrol, to the inside of the tube.

The result of his method of treatment was immediate cessation of the symptoms and recession of the drum, lasting from six to eight hours. In cases seen early, where bulging is not very pronounced, and where it could not be determined whether the case is going on to suppuration or whether it is a simple catarrhal inflammation, relief was permanent. Where the symptoms were very pronounced relief was only temporary. In a few cases the pain did not return, but the bulging of the drum membrane remained. Such patients were willing to stand the deafness as they were free from the pain, and they perforated in forty-eight hours. These cases healed

with a distinct round defect in the drum membrane, closed with thin scar tissue, which is more easily moved with the pneumatic speculum than the remainder of the drum membrane. He felt that such injury to the drum membrane caused a loss of hearing, and so he had ceased to treat acute otitis media by this method.

As to the comparison of his method of examination and that of Dr. Holmes, as suggested by Dr. Harris, none was to be made, each being supplementary to the other. It is quite important in many instances to look into the fossa of Rosenmüller with the salpingoscope, but until one has used the direct speculum it is difficult to realize what a place this fossa is. Sometimes it appears as a mere slit with reflected light, but when the direct speculum is put in, it is found to be quite deep. The treatment of the fossa of Rosenmüller is quite simple, and is carried out with the speculum.

The objection on the part of the patients to the speculum is of no consequence. They say that it does not hurt, but is disagreeable on account of the gagging. One patient, a young man, who fainted the first time the speaker tried to pass the eustachian catheter through the nose, after a few trials permitted him to pass the direct speculum without cocain.

DR. HOLMES, in closing the discussion, said Dr. Yankauer's statement about not being able to see the fossa of Rosenmüller was true of the pharyngoscope, but not of the speaker's instrument. The fossa can be seen in its normal condition, and can be operated upon when necessary.

He said the salpingoscope of Balentyne was one effort in the right direction, but it was not neatly designed. Patients do not object to the introduction and manipulation of the nasopharyngoscope. He used it in a child two and a half years old. Children do object to the light, so that it is better to introduce the instrument before lighting it.

In his first fifty cases he had found one growth in the tube. He removed it and presented it at the Boston meeting of this society, and he had seen but one growth in the tube since. In this series of almost 1,000 cases this would be two-tenths per cent. These statistics were not convincing, and he simply gave them as he found them.

In treating the tube by this method there is no staining with blood, as in the old method of treating the tube blindly.

The secret of success with this method is the avoidance of traumatism to the tube. The instrument enables one to treat the tube easily, unless there is deflection sufficient to require nasal operation.

XIX. (c) A Report of Twelve Cases Operated Upon by the Yankauer Method for Closure of the Eustachian Tube.

Dr. Samuel McCullagh, New York, discussed the advantages of this operation, the class of cases to which it is applicable, and the method of anesthesia employed, and briefly reviewed the histories of the twelve cases treated by him according to this method.

The cases were of two classes—those in which a radical operation had been performed, and those in which no operative treatment had been undertaken. Of the two cases in the first class, one was cured and one improved. Of the nine remaining cases, three were cured, five were improved, and one was classed as unimproved, the patient having passed from observation.

This gave 33 per cent cured, 56 per cent improved, and 11 per cent not improved. Of the three cases cured in the second class of cases, the time elapsing between the operation and cessation of the discharge was, six weeks, four weeks, and six weeks. Of both classes, 36 per cent were cured, 55 per cent improved, and 9 per cent not improved. Eliminating the case that was lost sight of, 40 per cent were cured, and 60 per cent improved. In the cases noted as improved, all so classed have expressed their satisfaction at the results of the operation.

Conclusions could not be drawn from so limited a number of cases, but the results obtained had convinced the reader of the paper that the method is a valuable and simple procedure, which eliminates the necessity for radical operation in a certain percentage of cases.

DISCUSSION.

Dr. Sidney Yankauer, New York, wished to emphasize certain points with reference to the indications for this operation. Consideration of the pathology of chronic suppuration would lead to a realization of the fact that all cases originate in diseases of the nasopharynx, and that where the disease has existed as long as in many of the cases just reported, various

pathologic changes have taken place in the middle ear and mastoid cells. Some of these changes are very slight, while in others they are of greater severity; that there may be slight changes in the ear, necrosis in the attic, disease of the mastoid cells, collections of pus around the sinus or in the subdural space, etc.

In order to cure chronic suppuration two surgical factors are necessary: first, to drain the purulent area, and second, to prevent reinfection. Reinfection taking place through the nasopharynx must be prevented by preventing the entrance of the germs through this region. This may be accomplished in various ways. An autogenous vaccine may be used; if properly made and employed, this will destroy the kind of germs from which it is made wherever they may exist in the body. But there is no way of knowing that a new infection will not arise. The only way to prevent such a contingency is to close the eustachian tube. The necessity of closing the tube in this class of cases is shown by the improvement which follows this procedure. When the radical operation is done the tube can be easily reached. Just as in the radical operation it is necessary to close the tube in order to secure healing of the parts, so it is in other cases. In all the minor operative procedures which can be carried out through the canal, success will result if the tube is closed. Whatever the form of treatment the closure of the eustachian tube is a necessity. This should be the first thing to be done. His own experience has shown that a certain number of cases will be cured by simple operations on the middle ear, others will always require radical procedure.

Dr. McCullagh had not succeeded in inverting the tube; that is not necessary. The speaker had failed to accomplish this in a majority of cases. In doing this large curettes should be used first, to be followed by the use of smaller curettes for cleaning out the angles.

Dr. Norton L. Wilson, Elizabeth, had had several cases cured by this operation, two of which he desired to report. The first had been under observation for over two years. The Heath operation was performed, without improvement; autogenous vaccine was employed for three months, and still the suppuration continued. After the Yankauer operation a permanent cure resulted. In the second case the ear had been discharging for years. This was checked by the operation

under discussion. Hearing was diminished, and the patient, who was neurasthenic, constantly complained of a sense of fullness in her ear, for relief of which she made insistent demand.

Dr. S. J. Kopetzky, New York, said the technic of the operation is very simple and easily performed. He has employed the method in nine cases, only one of which was cured. In two others the results were doubtful, because although they became "dry," the result was not free from suspicious circumstances in that they all had had previous periods of varying duration, during which they had been "dry." In six other cases there was no effect noted from the Yankauer operation. It was only fair, however, to add that these six cases had been selected cases in which no cure was to have been expected by anything short of the radical mastoid operation. They were submitted to this operation (the Yankauer) because they came within the range of indications for it as laid by Dr. Yankauer last year, which the speaker then thought were far too sweeping.

The speaker thought that Dr. Duel had struck the true keynote in his discussion yesterday, when he intimated that all these procedures have individual value in given cases, and one is not a substitute for the other. The Yankauer operation is not a substitute for the radical mastoid operation, although from the reports given this morning, where ossicles were removed, the tympanum curetted, and the eustachian tube closed, the speaker failed to see wherein the Yankauer operation as now advocated left the patient in any different status than he would be were a limited Stacke operation performed, leaving out of account the mechanics of the two procedures.

It was interesting to listen to Dr. Yankauer's advocacy of closing the tube, and Dr. Holmes' of keeping the tube open, in similar groups of cases, and both reporting cures. From a theoretical point of view it would seem that where the tube is kept open and the case cured, that one had succeeded in more nearly approximating the normal physiologic condition of the ear.

Dr. Frank Allport, Chicago, considered the Yankauer procedure another effort to evade the performance of the radical mastoid operation. He desired to commend any procedure which held out the hope of avoiding this operation,

but so far such efforts have been unavailing. Several operations have held out hope along these lines, but so far experience and time have demonstrated their uselessness. None of us will ever forget the extravagant praises which were sung for the ossiculectomy operation. Most of us have tried it, and I presume that all of us have been bitterly disappointed, inasmuch as most of these operations have returned to the surgeon for the performance of the radical mastoid operation. Then the Heath procedure, known by its various names, which is in reality only a modification of the Schwartze operation, had its strong advocates, and has some advocates even now; but certainly it must be admitted that at least outside of Dr. Heath's hospital, this operation has fallen very far short of giving the satisfaction which was hoped for it. Most of these cases have likewise returned for the radical mastoid operation. Now we have the Yankauer operation presented to us, and we do not as yet know what the consensus of opinion will be after the lapse of a year or two. At all events it should be tried by those who are willing to experiment in new and untried procedures, and after a while the Yankauer operation will find its proper niche, and we will no longer have to question as to its wisdom and usefulness. Only time, experience and honest trial can determine the rightful position of this operation. Personally, however, the speaker is willing to venture the opinion that it will be only in an extremely few cases where this operation will be shown to be a suitable substitute for the radical mastoid operation. Dr. Yankauer has freely admitted that many cases are not cured by his method and that a certain percentage still have a discharge; and the speaker feels that as long as there is any discharge whatever, something is wrong, and if this discharge persists that the patient will probably have to submit ultimately to a radical mastoid operation. Dr. McCullagh stated that many cases will not be cured by the closure of the tube alone, but that in addition to this an ossiculectomy has to be performed. The speaker would therefore like to ask Dr. McCullagh how much advantage in such cases the method under discussion possessed over the Heath or the modified Schwartze operation? There is no danger in the Heath or the modified Schwartze operation, and if the case gets along well the ossicles are not removed and the hearing is conserved. Where

it is necessary to remove the ossicles, it would seem as if the Heath or the modified Schwartze operation would be better than the Yankauer procedure, plus the removal of the ossicles.

All of these operations undoubtedly do some good, but, after all, in the light of our present knowledge, the radical mastoid operation, properly performed, is the only bulwark upon which we can confidently rest.

DR. MCCULLAGH, in closing the discussion, referred to Dr. Kopetzky's remark concerning the facilitating of a cure by keeping the tube open, as suggested by Dr. Holmes, and said he did not consider that a drum membrane with a perforation approaches the normal.

Replying to Dr. Allport, he reiterated the statement made in his paper, that the method under discussion saves a percentage of cases from the radical mastoid operation. What that percentage is he could not say, but no matter what it is, it is a gain in the conservative surgery of this condition. The operation is so slight that it is really not an operation from the patient's point of view. In the event of failure, the radical operation can be employed.

The operation is intended for chronic cases, where the ossicles are more or less disturbed, and where they have no effect at all upon the hearing. The object of removing the ossicles is solely for the purpose of getting freer drainage and obtaining surgical cleanliness in the cavity.

XX. (d) The Medicoeducational Problem of the Deaf Child.

DR. G. HUDSON-MAKUEN, Philadelphia. The problem of the deaf child has engaged the attention of physicians and teachers for more than two hundred years, and we are only now approaching a satisfactory solution of it. In the working out of the problem and in the practical application of the theories which have been advanced, the combined efforts of the physician and teacher are necessary because of the many pathologic, physiologic, psychologic and pedagogic points involved. The physician is not sufficiently pedagogic, and the teacher can scarcely be supposed to have the requisite knowledge of the other related sciences, to enable him to prosecute this work alone.

Deaf children differ among themselves as normal children differ, and each one presents a distinct individual problem.

It is the function of the physician to prevent deafness, and failing in this to cure or ameliorate it; and it is the function of the teacher to prevent the natural result of deafness, which is mutism.

Deafness should be carefully distinguished from mere hardness of hearing with its many peculiar and interesting phases. Deafness may be quite incurable, but many forms of hardness of hearing are susceptible to treatment, and subject, if not to cure, to at least marked improvement.

Hardness of hearing for speech is often the result of defective cerebral conditions, which may be improved by education.

Some of the many forms of defects of speech found in children with apparently normal hearing are often due either to a hardness of hearing for speech sounds, or to what has been called mental deafness; a condition resulting in a slight perversion of the cerebral faculties, which sometimes interferes with the interpretation of speech sounds. Children having such defects of speech can best be trained by teachers of the deaf, although, of course, they should be placed in classes by themselves.

XXI. (e) The Practical Value of Lip Reading.

DR. MAX A. GOLDSTEIN, St. Louis. Lip reading is not a recently developed aid to the deaf, nor is it a new system of special instruction. The evolution of lip reading as a systematic training, arranged on scientific and phonetic principles, is of more recent origin, and in its present stage of development offers to the deaf and the partially deaf, opportunities for social intercourse which may largely compensate for impairment or loss of such an important sense organ as the ear.

There are two classes of the deaf to whom this course of special training is applicable: the first comprises all types of the congenital deaf who have never heard the sound of the human voice, and the large group of cases in which total deafness has developed before the eighth year, or where the acquisition of speech and language has been forgotten.

The importance to the otologist, as well as to the incurably deaf patient, of a knowledge of the art of lip reading or speech reading requires no discussion. To the partial or incurable

deaf the acquisition of lip reading is a manifold blessing. To the otologist it offers a consolation for his inability and impotency to cope with certain forms of aural pathology, and it places him in a position to restore the peace of mind and to instil new hope in his deaf patient.

There is a vast difference in the acquisition and perfection of the science of lip reading by the congenitally deaf pupil on the one hand and that of the pupil with acquired deafness on the other.

The difficulties of acquiring a practical working knowledge of lip reading have been overestimated. Age is no handicap to the acquirement of proficiency in lip reading, if good sight, a fair degree of intelligence and an ordinary vocabulary of spoken language are the assets of the pupil.

The case was cited of a profoundly deaf young woman who, in less than two years, had become equally familiar with German, French and English. The need for experienced teachers was emphasized. The otologists should be able to answer the question, "Where may I obtain such instruction?" To complete the paper the author added a list of special normal schools and private instructors where such training is offered to intelligent, active, patient, observant men and women to perfect themselves as teachers of the deaf.

The principles of lip reading may be mastered in comparatively few months, but the practical value of this art will perhaps be appreciated only after proficiency is attained by considerable practice. A pupil of average intelligence and alertness may master the principles of lip reading in from five to six months, taking two hour-lessons each week. Add to this one year of daily practice for accuracy and speed, and the time of pupil service is completed.

In an endeavor to cooperate in an endeavor to plan a general movement for the education of the public to the value of lip reading as a system of instruction for the deaf and partially deaf, the attention of the medical profession was directed to the opportunities and resources which a knowledge of lip reading may afford this class of people; the specially qualified teachers to the worthy cause in which they may be enlisted; the otologists for the boon which they may confer on that large class of the deaf heretofore so seriously handicapped in carrying out their social and economic functions. All who

may be interested in this work should realize that there is no effort in the wide realm of education more heroic or more charitable than the emancipation of the deaf.

DISCUSSION.

PROF. JOHN DUTTON WRIGHT said: I have listened with great interest to the two valuable papers that have just been read. I was delighted with Dr. Makuen's little patient and congratulate him upon what he has been able to do for her. He spoke of his observation that during the last year she had begun to notice sounds to which she had formerly appeared to be wholly deaf. That is a very common occurrence with my own pupils who have, like Dr. Makuen's patient, some slight power of sound perception. The persistent training which they receive in the use of this slight hearing, which can be somewhat accurately described by the term "latent," fixes their attention upon the impressions that are received through it, and gives a significance to sounds that had always reached them perhaps, but had been ignored because they brought no help or information. In the last analysis we hear with our brains, and it is a matter of common observation that when our attention is occupied we actually do not hear sounds about us that are foreign to our thoughts, but ignore them as valueless. We frequently say of these children, "How much more they hear!" Whereas in all probability the actual power of sound perception has not increased, but the brain has been trained to discriminate and interpret the sounds, with the result that ideas are generated.

I most heartily endorse the strong paper read by Dr. Goldstein, and feel sure that much benefit will come to the deaf through the increased interest which otologists are showing in the educational phase of their treatment.

The acquisition of the ability to interpret speech by the visible movements involved in it, with little or no aid from the ear, is surrounded with much the same difficulties as the acquisition of any other intellectual accomplishment. If a profoundly deaf person will put forth the same amount of effort, and spend the same amount of time in the study and practice of the art of lip reading that even an ordinary player on the piano must expend in order to acquire a very moderate degree of proficiency in musical expression and com-

prehension, he, or she, will reap a much greater reward of personal satisfaction and comfort than the pianist secures. I believe that while there may be some persons who cannot acquire even a moderate skill in music, there is no one who cannot acquire a most useful amount of skill in lip reading. But, just as there are natural musicians, so there are natural lip readers. Some attain it almost without conscious effort, and wholly without instruction. To others it comes slowly and laboriously. The best lip readers are entirely ignorant of the technic of lip reading and the laws of phonetic analysis upon which it is based. But there are other minds that do not seem able to grasp it intuitively, and so must have the anatomic structure laid bare and explained before they comprehend the significance of the visible forms. As it is a purely intellectual process, involving practically no muscular activity, the psychology of it enters largely into the problem. For this reason a cut and dried system of instruction in lip reading is perhaps less applicable to all cases than fixed methods of instruction in most other useful arts. For example, in the case of one individual, the introduction at the beginning of his instruction of a systematic analysis of the phonetic elements of language from a standpoint of visibility and resemblance, may ruin the chances of final success of the pupil, while to another mind it is a necessary preliminary. In general, my own observation has been that the technic of the art should be taught last, and the earliest efforts should be aimed at the establishment of the proper habits of thought and mental attitude toward spoken language.

While it is perfectly true, as Dr. Goldstein has said, that the obstacles to success in lip reading have been sometimes exaggerated, and candidates have been unduly discouraged from undertaking the work, it is also true that people have sometimes been led to expect too much. Owing to the absolute difference in the construction and operation of the eye and ear, they cannot be wholly interchangeable in the performance of their functions. Owing to the fact that the eye must be consciously focussed upon the source of the impressions transmitted by it to the brain, it is impossible for a lip reader to follow a rapidly shifting conversation in a group of people when there is no telling the point from which the next remark may come. For the same reason, owing to the

conditions of light and movement at the theater, and to a somewhat less degree at church and lectures, it is impossible, ordinarily, for even an expert lip reader to get more than an occasional phrase or sentence. But by far the greater part of the intercourse of life is or can be individual and face to face, and here lip reading reaches its maximum efficiency.

Dr. Goldstein has touched upon a vital point in his reference to the need of teachers of lip reading scattered throughout the country, and I most earnestly urge upon your attention his very practical suggestion of a way of supplying this need. He urges otologists in various parts of the country to search out promising persons and induce them to go to some training class and fit themselves to teach lip reading. My more than twenty years of service along this line has convinced me that at present no single place of training possesses all that is of value. I believe that there should be such a center, and I believe that this organization could be instrumental in creating that center. I very much wish that your society might choose some bright, wideawake young physician, physically and mentally adapted to the teaching of lip reading, and induce him to enter upon this task, by going to the fountainheads of information on the subject, both in this country and in Europe, with the understanding that when he had gathered all that is worthy of adoption he should establish himself in some centrally located city, where, under the patronage and with the endorsement of this powerful organization, he could become the nucleus of a school exclusively devoted to the training of teachers of lip reading in whom the medical profession could repose the greatest confidence. It would be perfectly feasible for the members of this society to send him an adequate number of students for training, each of whom would pay a reasonable amount for the course, and on their return to their respective communities you gentlemen would easily be able to supply them with a satisfactory number of pupils.

It would give me pleasure to cooperate with a committee of your society, and to examine and test, in the light of my knowledge of the requirements, any young men that the committee might have under consideration for the task, and share in the planning of the course of preparation for the work. I believe that through the co-operation of your society an insti-

tution could be established that would gradually come to be of great usefulness and importance. I hope that you will either appoint a committee or instruct the present existing committee to consider the feasibility of this suggestion and report at some early sectional meeting.

If this report should be favorable, you could then give the matter such publicity as would bring applicants for the work, from whom you could choose the one that seemed best fitted to undertake it. The members of the society would naturally reserve to themselves the privilege of nominating candidates for the training, and the institution might be known as "The Trilogical Training School for Teachers of Lip Reading."

DR. B. R. SHURLEY, Detroit, heartily approved of the presentation of this subject before the society at this time, and of the spreading of information to the profession at large concerning this important problem. As the internist has busied himself with the problems of tuberculosis, and the ophthalmologist with that of ophthalmia neonatorum, so the otologist should devote his attention to the question of the deafmute. The society and other similar organizations could accomplish an enormous amount of good by the dissemination of knowledge concerning the care and development of deafmutes. Of the schools for the teaching of the deaf in the United States, only four are located in the West, and none in the South. Practically all deafmutes could be taught by the oral method, yet only about twenty per cent of them receive such instruction at the present time.

The value of lip reading in cases of otosclerosis is not duly appreciated. Many such cases leave the otologist with practically all hope gone. This should not be so; the otologist should be able to give some hope of instruction which would lead such patients to greater usefulness. The problem of teaching the deaf in the large cities should be developed thoroughly. One method of disseminating knowledge on this subject is through the state medical societies. Papers embodying the essential facts and the most progressive ideas on the subject would accomplish a great deal.

DR. MAKUEN, in closing the discussion, expressed hearty sympathy with the motion just passed, and also with the remarks embodied in Dr. Goldstein's paper. He was looking

forward, however, to a broader work than that suggested, a movement which would include defects of speech. He considered it of great importance to correct defects of speech, of which deafness is one of the causes. He would like to see a training school started for the training of teachers for the correction of defects of speech, including the training of the deaf and lip reading.

DR. GOLDSTEIN, in closing the discussion, emphasized the fact that this work is as much the duty of every member of this society and of all otolaryngologists as it is of the few who have given up more or less of their time to it.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, January 24, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

DR. EMIL GRUENING read the following

In Memoriam, in Honor of Dr. Charles J. Kipp,

of Newark, N. J.:

Dr. Charles J. Kipp died of pneumonia, after a brief illness, on January 13, 1911.

Dr. Kipp was born in Hanover, Germany, October 22, 1838. He came to the United States at the age of sixteen, and was graduated from the College of Physicians and Surgeons, New York City, in the class of 1861. Shortly after his graduation he joined the army as assistant surgeon, and served throughout the war. In 1864 he was promoted, with the brevet rank of lieutenant colonel. He resigned from the army in 1868, and devoted himself to the practice of diseases of the eye and ear. Settling in Newark, he attended the Out-Door Department for eye and ear diseases at St. Michael's Hospital. Later he founded the Newark Eye and Ear Infirmary, where he filled an active position until his death.

Though living at a distance, he regularly attended the meetings of this society, and took an active part in its proceedings.

His sterling qualities and painstaking care have endeared him to the community at large.

The medical profession bestowed upon him the highest honors. He was at one time president of the Medical Society of the State of New York, he was one of the vice-presidents of the American Medical Association, and from 1897 to 1898 he was president of the American Ophthalmological Society. One year later he was president of the American Otological Society.

His contributions to medical literature were numerous and valuable. He was the first to observe that otitic thrombosis of

the lateral sinus was frequently accompanied by optic neuritis.

The society loses in the death of Dr. Kipp one of its charter members, one of its staunch friends, and an experienced and indefatigable worker.

In commemoration of his useful life this record is spread upon the minutes of the society.

DR. PHILIP D. KERRISON presented a case of

Labyrinthine Fistula

with gradual recovery from a circumscribed suppurative labyrinthitis. The patient, a woman 35 years of age, had suffered from left chronic middle ear suppuration of many years' duration. When she first came under observation two months ago, the condition of the left ear was as follows: Left membrana intensa and Schrapnel's membrane were practically destroyed; inner wall of tympanum partially covered by epidermis; hearing very markedly impaired; caloric reaction absolutely negative. Under careful cleansing treatment the hearing has gradually improved and the caloric reaction has returned to practically normal. She gives, however, a very positive response to the fistula test—i. e., compression of air in the left meatus causes very marked rotary nystagmus directed toward the opposite (right) side.

The case is presented as a rather unusual picture of circumscribed labyrinthitis with fistula in which apparently the membranous labyrinth has practically recovered function.

DISCUSSION.

DR. GRUENING thought the case showed that if the vestibular apparatus does not functionate one should wait. According to the Vienna school this would be a case for immediate operation.

DR. DUEL thought it possible to elicit the fistula symptom in cases where there was absence of the caloric reaction and complete deafness. The fistula test, as Dr. Rae had pointed out, was possible only in the presence of a functionating vestibular nerve. The current passing over the vestibular apparatus in the fistula test, produces a single movement of the eyes in each direction from alternate compression and decom-

pression, whereas the current set up by the heat or cold of the caloric test being continuous caused repeated vestibular movements in one direction with oculomotor recoveries in the other. The fistula test could be elicited while the patient is under an anesthetic. The fistula symptom often remains for some time in cases where a diffuse suppurative labyrinthitis is taking place, and it is often possible to get it when the caloric reaction is absent.

This is due to the fact that strong pressure was capable of producing a movement of the fluid in the canals, where the disease had so altered the contents that conviction currents would not be set up by heat or cold, as employed in the caloric tests.

Dr. Duel said if the radical operation is resorted to in such cases, great care should be exercised to prevent trauma of tissue. Radical operation with hammer and chisel might by the necessary concussion set up diffuse labyrinthitis. He thought the case a subject for radical operation without undue trauma, and without interference with the labyrinth itself.

Dr. Kenefick said Neumann taught that in cases of suppurative labyrinthitis where the hearing disappeared rapidly operation should be performed, but where theh hearing improved operation should not be resorted to. In Dr. Kerrison's case the hearing improved.

Dr. Kerrison added that Barany of Vienna had observed or collected the records of a large number of cases in which the fistula test had shown positive reactions and which came later to operation, and in not one had the fistula been found absent.

Pain Over the Mastoid.

Dr. Stephen H. Lutz related the history of a nurse at the Brooklyn Eye and Ear Hospital, who for over a year had been complaining of pain over the left mastoid. About a month ago the pain became very intense, and there developed a temperature rising as high as 102 degrees in the afternoon and evening, and continuing through the night. There was slight bulging of the posterior superior wall and extreme tenderness over the tip of the mastoid. After about a week with no improvement, he opened the mastoid and found a sclerotic mastoid with two small cells just over the tip filled with pus. There was nothing in the antrum. Because of these findings

the external wound was closed. In five days the dressing and sutures were removed, and four days later the wound was absolutely healed. She had pain for about three days more, and it then disappeared. Apparently there was not enough to warrant operation in this case, and he wondered if he was justifiable, in view of the persistent temperature, in operating. The character of the pus from the cells was unknown, as unfortunately the smears were lost. The blood count was normal.

DISCUSSION.

DR. DENCH said there is abundant evidence to prove that in very mild otitis media the infection may spread to and over the mastoid cells and yet the otitis subside without operation.

DR. DUEL, referring to the question of blood counts, spoke of an interesting case which had recently come under his observation at the New York Polyclinic Medical School and Hospital, which showed the fallacy of depending upon this aid in certain conditions. The patient was an Italian laborer upon whom he had operated for mastoiditis, and who returned to the hospital with a chill and high temperature. He was kept in the hospital for forty-eight hours, during which time he had two or three vascillations of temperature from normal to 105 degrees. A blood count, made on the second day, showed whites under eight thousand, but owing to the septic appearance of the patient, and the fact that he had chills and a septic temperature, it was decided to operate. The speaker uncovered the sinus and ligated the jugular, finding a clot which extended down into the bulb. The clot was not examined. For four or five days after the operation there were wide vascillations of temperature with all the evidences of extension, perhaps, to the petrosal. Another blood count showed whites under eight thousand. The patient eventually recovered. The polymorphonuclear percentage was seventy.

DR. DENCH held that with a low white blood count a polymorphonuclear count of seventy is high. A negative differential count in sinus thrombosis was of no value. The temperature, pulse and appearance of the patient were the indications for operation. In the presence of low resistance and a septic condition, operation should be resorted to, no matter what the count shows.

Drainage of Labyrinth With Hearing Existing After Two Years.

DR. E. B. DENCH presented a case of labyrinthine disease in which he had drained the labyrinth thoroughly through the horizontal semicircular canal. Contrary to expectation, after two years the patient was found to have considerable hearing on the affected side, and to react to the turning test. The case proved that in a certain number of instances draining the labyrinth does not destroy hearing. He took off the vestibular end of the horizontal semicircular canal and then removed a layer of bone between the oval and round windows. He drained the cochlea but did not destroy the modiolus. The patient was rotated with the head erect. He had normal reaction on the side on which the labyrinth had been drained.

DISCUSSION.

DR. GRUENING held that the patient certainly had a cochlea, as it had been decided that one cannot hear without it, and he also had a vestibule.

DR. DUEL said with the vestibule, cochlea and the horizontal semicircular canal destroyed it was unthinkable that there would be hearing. If there is hearing there must be a cochlea. It was impossible to preclude the possibility or probability of hearing coming from the other side without some apparatus which would eliminate that in the test.

DR. DENCH said the rotation test was quite independent of the other side. One labyrinth was made minus and the other plus. The patient must react from the vestibule which is being tested. With the Barany apparatus one might get some bone conduction, and with one ear plugged and the other open, the conduction through the eustachian tube was enough to give hearing. The labyrinth was absolutely dead in this case.

DR. DUEL said he had had cases with complete loss of function of one labyrinth in which it was possible to get a reaction (after-nystagmus) in the horizontal plane equally well after whirling in either direction. He considered it much easier to explain the fact that Dr. Dench's patient had after-nystagmus nearly as much on one side as the other by the fact that it is a compensatory reaction. This would seem more rational than to record the fact that a semicircular canal which had been destroyed was now functionating. One might

as well say that a man with one eye had binocular vision because he had compensated for his loss well enough to judge distance accurately.

Streptococcus Capsulatus in the Blood.

Dr. J. E. Sheppard continued the history of a case reported at the November meeting of the society. At the time of that report, November 22, 1910, the patient's blood showed the streptococcus capsulatus, and when examined yesterday this organism was still present in the blood. The man entered the hospital on November 2d, with a temperature of 103.8 degrees. He objected to operation and was kept under observation. When he came in the blood count showed thirteen thousand white cells, with seventy-four per cent polymorphonuclear leucocytes. The count ranged from six to eighteen thousand whites, with from sixty-four to eighty-four per cent polymorphonuclears, for the next three weeks. On November 4th and 7th Widal reaction was negative. On the latter date the streptococcus capsulatus was found in the blood. It was found also on the 14th, 18th, and 21st. On November 25th the report was negative, and the patient was allowed to go home. On the 29th he returned to the hospital complaining of pain, swelling, and interference with motion in the right elbow joint. This proved to be due to an abscess in which was found the streptococcus capsulatus. An abscess in the right side of the chest, which contained the same organism, was opened on January 9th. During the patient's second stay in the hospital blood cultures were taken on January 3d, 10th, 11th, and 14th, all of which were negative. A note in the history said that on January 18th the agglutination reaction was remarkably high, the patient's blood being particularly active in clumping the streptococcus capsulatus. The pathologist who studied the blood in this case thought the reason the presence of the germ in the blood of this patient was not as serious as it usually is was because of his power to manufacture within the body large amounts of bacteriolysins and cytolysins, which were able to take care of the germs. There were large numbers of the germs per cubic centimeter in the blood, but they were quickly reduced because of the active foe to the germs which the patient was able to beget in his blood.

DISCUSSION.

DR. GRUENING called attention to the fact that the infection may have originated from some other focus than the ear, which seemed to be the only focus present in the case. Perhaps the sinus should have been ligated. He considered these serious cases, and was inclined to question whether the end had been reached in this instance. According to the newest experimental researches, as published in *Schwartze's Archives,* the streptococcus precedes the sinus thrombosis. Some held that it is not necessary to operate, others that operation should be resorted to, but not necessarily ligation of the jugular nor operation upon the sinus. He thought operation indicated in the case cited by Dr. Sheppard, but whether it was necessary to ligate the jugular or to operate upon the sinus was a question.

DR. SHEPPARD referred to what he had already reported concerning the case, dwelling upon the fact that the symptoms—bulging of the drum membrane, elevation of temperature, etc.—subsided, and that the patient was feeling so well that the speaker hesitated about operating, even though there were streptococci found in the blood. After the report of the sterile condition of the blood came in the patient left the hospital, and when later he returned with the abscesses on the elbow and chest wall, the blood culture was still negative. The only operation was incision of the drum membrane.

DR. GRUENING said the mastoid operation would have been performed on this case at Mount Sinai Hospital, and probably the jugular might have been tied. On the strength of the findings this would certainly have been the procedure.

DR. DENCH recalled a case operated upon at the New York Eye and Ear Infirmary long before blood cultures were known, in which streptococci were found in the vein wall. Infiltration of the vein wall occurred, as it undoubtedly does, before the thrombus had formed. The thrombus was secondary and often sterile.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, March 28, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

Acute Suppurative Labyrinthitis in Conjunction With Acute Otitis Media Suppurativa.

DR. ARTHUR B. DUEL presented a young girl who had never had ear disease previous to November 3, 1910. At that time there developed acute otitis media following an attack of grippe. The right side was involved, the pain was severe, and the temperature high. Within twenty-four hours after the onset the drum membrane on the affected side underwent spontaneous perforation, and a profuse discharge followed. The speaker saw her first on November 7th. In the meantime she had been having irrigations of the ear, and the family physician had given her a purgative medicine which acted rather severely. During one of her visits to the toilet she fainted, this being the only instance of dizziness. The patient was sent immediately to the hospital for operation upon the mastoid. The mastoid was found to be filled with pus and serosanguinous fluid. On the second day after the operation acute otitis media of the left side developed. There was no nausea, no vomiting, and repeated examinations failed to elicit evidence of nystagmus. The high temperature which followed for three or four days after the mastoid operation was attributed to the acute otitis media of the other side. She continued to have a profuse discharge from the second acute ear, but this was not operated upon. Upon finding, after eight or nine weeks, that she had very poor hearing on the side of the mastoid operation, a functional test was made, whereupon it was discovered that she had completely lost the hearing on that side. The caloric test was negative, showing that she had no function in the vestibular apparatus of that side. The left side was then operated upon, when the mastoid was found to be filled with pus and granulations. Healing was perfect on both sides and the middle ear suppu-

ration subsided completely. Functional tests having shown the absence of the vestibular apparatus, the assumption was that she had gone through an acute suppurative labyrinthitis which destroyed the vestibular and cochlear apparatus without exhibiting the characteristic symptoms. The noise apparatus showed absolutely no hearing on the right side. Tuning-fork tests had been made. A 256 v. s. fork was referred by bone conduction to the left side from all positions.

DISCUSSION.

DR. GRUENING called attention to the possible similarity between retinitis and labyrinthitis in certain cases in which the destruction takes place by chemotactic reaction. It is almost impossible, in such cases, to know that the process is going on. It is only where the suppuration can be seen that it is possible to know. The loss of hearing might be due to something other than pururlent labyrinthitis; it might be the result of destruction of the terminal apparatus by high pressure.

DR. DUEL added that, although the suppurative labyrinthitis had existed only since November, more than a month ago he had made the whirling test, which he had since repeated several times, without being able to notice any difference in the time of the after-nystagmus from the functionating horizontal semicircular canal, whirling in either direction. This suggested Dr. Dench's case shown at the last meeting in which a similar compensatory action following a destructive operation of labyrinth had in his (Dr. Dench's) opinion been wrongly attributed to a return of function of the vestibular apparatus of the operated side. In this case the function on the right side of the labyrinth has been destroyed by disease, yet the patient is compensated for this so perfectly that she now responds to the whirling test by an after-nystagmus equal in either direction. He had had two other cases in which the labyrinth had been destroyed and in which the whirling test showed the same compensation. Instead of accounting for this by saying that the vestibular action has returned on the side operated upon, it would seem much more rational to say that compensation has been so exact that one side now does the work of both.

DR. GRUENING, in connection with the case under discus-

sion, cited the case of a young man who was absolutely deaf on one side and who had acute suppurative otitis media on the other side. A physician made a paracentesis, after which the patient became absolutely deaf on that side. The speaker saw him first after he became totally deaf, having been called in on account of mastoiditis. The mastoid operation was performed, and the patient made a perfect recovery from the operation, but he never recovered the hearing. The young man finally went to Vienna, where he saw all the great men. It could not be said that the paracentesis caused the deafness, or that purulent labyrinthitis was induced by the opening of the round window. There are other conditions which induce absolute deafness with which no one is yet acquainted.

Dr. Duel, answering a question by Dr. Harris as to how long after the first mastoid operation the deafness was discovered, said the discovery was made during the course of convalescence from the first operation, probably three or four weeks afterward. The patient could recall no vertigo, no nausea, no vomiting, or anything else of significance, except the fainting on the occasion cited.

Answering a question by Dr. McKernon, as to what the hearing was in the right ear at the time of operation, the speaker said no careful functional test was made at that time. The whisper test was made, and it was found that she could hear the whisper, so that evidently the hearing had not then been lost. Careful inquiry failed to elicit a history of any previous trouble with the ears, and so far as the patient knew her hearing had been perfect.

Recurring Bleeding From the Ear.

Dr. J. E. Sheppard related the history of a young woman, eighteen years of age, in good health, who two years ago had recurring bleeding in small quantities from the left ear, lasting for a month or two. Ever since this first appeared she has been partially deaf and has had some pain at intervals. At times a throbbing in the ear, not connected with the pain, and tinnitus like the dropping of water. The eustachian tube was free, and the tympanic cavity dry. A hemorrhagic spot can be seen in the tympanic membrane, which the speaker thought to be purpuric. He presented the patient for the purpose of showing the color of the membrane.

DISCUSSION.

DR. ALDERTON was reminded by this case of one which had been sent to him two or three weeks before, in which there was a little growth at the umbo about the size of the head of a pin. It was slightly raised from the drum membrane and was very red. The remainder of the drum seemed to be normal. The tympanic cavity and tube, upon inflation, were found to be clear. The diagnosis of angioma was made, and the patient was advised to report from time to time for observation. This patient was a woman forty-four or forty-five years old, who had just finished the climacteric. He had been wondering, since seeing Dr. Sheppard's case, if the conditions are not the same.

DR. GRUENING said the condition might be due to a deposit of the coloring matter of the blood in the interstitial layers of the drum membrane. The same condition might be found in the cornea.

DR. DENCH suggested that the injection might have touched the otic ganglion.

DR. SHEPPARD, in closing the discussion, said the drum membrane had presented this appearance for at least two years, according to the history of the case. Upon inflation there is no change whatever in the color of the drum. He had thought vaguely of an explanation such as Dr. Whiting had offered, but had not shaped it in this definite way.

DR. E. B. DENCH reported a case of

Persistent Tinnitus Treated by Means of Division of the Auditory Nerve Trunk.

The patient came under his observation at the New York Eye and Ear Infirmary three weeks ago, giving a history of tinnitus of the right ear of so persistent and severe a character that he threatened suicide if not relieved. He was neurasthenic. There was some specfic involvement, the Noguchi test proving positive. The drum membrane on the right side showed the changes of moderate nonsuppurative inflammation. The tinnitus, which had persisted for several months, was so severe that division of the auditory nerve trunk seemed the only method of relief. The dangers of the operation and the possibilities of facial paralysis were explained to the patient,

and he decided to take the chances. The operation was accordingly performed in two stages, the first part three weeks ago, and the second one week later.

The operation may be briefly described as follows: The patient was shaved from three inches below the nape of the neck to a point about two inches beyond the parietooccipital suture. The entire posterior aspect of the neck and the shaved area of the head was thoroughly sterilized and covered with a sterile dressing before the patient was put upon the table.

The patient was placed prone upon the face, the shoulders being well elevated and the head being supported at the forehead in a proper headrest. In this way, the neck was flexed as strongly as possible, rendering the tissues in the posterior cervical region tense. The anesthetic was administered with two catheters introduced through the anterior nares, these catheters being connected with a long tube so that the anesthetist was removed at a considerable distance from the patient, and was thus entirely out of the way of the operator and his assistants. The incision was made from just below the prominence of the second cervical vertebra, upward and a little to the left of the median line to a point just above the external occipital protuberance. The incision was then carried horizontally outward to a point just above the level of the line of auricular attachment, and was then carried vertically downward along the posterior border of the mastoid process to a point just below the tip of the mastoid. The first incision divided simply the skin and the superficial fascia. Pressure on the margins of the wound by the hands of the operator and his assistants, controlled the hemorrhage until the bleeding points could be grasped with clamps. The superficial flap was rapidly reflected downward throughout its entire extent. The incision was then deepened on every side, and the musculoperiosteal flap was reflected in the same manner. Hemorrhage was fairly free but was easily controlled. The mastoid emissary vein was divided as it emerged from the mastoid foramen. The hemorrhage was quickly and completely checked by plugging the mastoid foramen with a bit of sterile wood. The cerebellar dura was then exposed, by means of the gouge, at a point just below the inferior curved line, where the bone is extremely thin. This opening was rapidly enlarged by means of the rongeur forceps, care being taken to separate

the dura from the overlying bone by the introduction, first, of a blunt director, and later, as the opening was increased in size, by means of the finger, so as to avoid any injury of the dura. In this way the cerebellar dura was exposed from a point just beyond the left of the median line upward to a point just above the lateral sinus, outward along a line corresponding to the sigmoid sinus, and downward to a line just above the foramen magnum. It did not seem necessary to open into the foramen magnum in this case, although no harm results from this procedure. The cerebellar dura was thus exposed over an area bounded on the left by the occipital sinuses, above by the lateral sinus, on the left by the sigmoid sinus, and below by a thin margin of bone just above the foramen magnum. The field of operation was irrigated quite frequently with a warm saline solution, in order that the normal temperature of the brain might be preserved. All hemorrhage was carefully controlled and the musculoperiosteal flap was then replaced and held in position by interrupted catgut sutures. The cutaneous flap was next replaced and held in position by interrupted sutures of silkworm gut. This constituted the first step of the operation. The patient was then returned to bed. Aside from the slight rise in temperature alluded to, the patient exhibited no untoward symptoms. He was given urotropin in doses of 45 grains daily for the next week, and one week after the primary operation, the second step of the operation was performed, as follows: The cutaneous and musculoperiosteal flaps were again reflected downward, and a dural flap was turned downward. In the formation of this dural flap the dura was incised just internal to the occipital sinuses, vertically upward to a point just below the lateral sinus, then horizontally outward along the line of the lateral sinus, and then downward just internal to the sigmoid sinus. The dural vessels could be easily seen and were surrounded by ligatures of fine silk prior to their division. On reflecting the dural flap the cerebellar hemisphere presented. It was retracted upward, inward and outward by means of a thin metal retractor, care being taken not to wound any of the blood vessels which traversed the surface of the cerebellum. It was necessary to manipulate the parts with the utmost gentleness, as a rupture of any of the cerebellar vessels would have caused sufficient hemorrhage to interfere seriously with the completion of the

operation. On retracting the cerebellum a large amount of cerebrospinal fluid escaped. The cerebrospinal fluid and the slight hemorrhage somewhat obscured the field of operation, but the cautious use of gauze sponges effected the removal of this fluid. The slight venous oozing which occurred was then controlled by the use of sponges saturated in a 1/1000 solution of adrenalin chlorid. The use of the adrenalin chlorid caused a cessation of all hemorrhage, and was also of value, I think, in raising the blood pressure, as the patient suffered no diminution of blood pressure throughout the entire operation. Throughout the operation the field of operation was frequently irrigated with a warm normal saline solution, in order to maintain the brain substance at as nearly a normal temperature as posible. By cautious manipulation in this manner the nerves at the base of the skull were finally freely exposed. The auditory nerve, with the facial nerve accompanying it, was easily recognized entering the internal auditory meatus. The facial nerve was then stimulated by means of the faradic current, a sterile electrode being introduced into the cranial cavity and applied directly to the facial trunk, the opposite pole of the battery being applied to a neutral point. The auditory nerve was then severed by introducing a grooved director between the auditory and the facial nerves and pulling the director downward and outward. The central end of the auditory nerve was then pulled out from its central attachment by means of forceps. The cerebellar fossa was again irrigated with normal saline solution and the cerebellum allowed to drop back into place. The dural flap was replaced and held in position by fine silk sutures. The musculoperiosteal flap was next replaced and held in position by catgut sutures. The cutaneous flap was then brought into place and held in position by interrupted sutures of silkworm gut. After the second step of the operation, the patient made an uneventful recovery.

The operation had been performed about ten times in the history of medicine. Ballance, of London, had one case, in which there were some cerebral symptoms, and in which facial paralysis was already present. In the speaker's case there were no cerebral symptoms and no facial paralysis. The operation seemed justifiable in the presence of such severe and persistent tinnitus.

DISCUSSION.

Dr. Sheppard cited in this connection a case which had been in the care of Dr. Harvey Cushing, of Baltimore. Last August the patient, a woman, had been given an injection of alcohol for neuralgia in the lower jaw. Immediately following the injection she vomited continuously for thirty-six hours or more, having to remain in the doctor's office where the operation was performed for five or six hours before it subsided sufficiently for her to return home. Immediately after the subsidence of the vomiting she began to complain of tinnitus. The speaker saw her in October, at which time she complained of more or less deafness and of severe tinnitus. Examination revealed a small perforation in the anterior inferior quadrant of the drum membrane. During the next six weeks the drum membrane simply melted away without any evidence of inflammation. The patient then went down to see Dr. Cushing, who said he believed the auditory nerve would have to be destroyed in order to relieve the tinnitus. What destroyed the drum membrane the speaker did not know. Even if some of the alcohol at the time of the injection had gone into the eustachian tube, he could not understand why it should cause the melting away of the drum membrane. The condition might be the result of some disturbance of the trophic nerves. There was no history of tuberculosis. The neuralgia for which the injection had been made involved the inferior branch of the trifacial.

Dr. Dench, in closing the discussion, said the tinnitus had absolutely subsided since the operation. Answering a question by Dr. Harris, as to whether Richard Lake had employed the same technic in his cases, all of which were unsuccessful, the speaker expressed his impression that Lake operated first upon the labyrinth. Bryant had looked up the literature of the subject, reporting, as he recalled it, nine or ten cases. Most of these cases died. Ballance's case had a number of untoward symptoms after the operation. In his own case there were very few symptoms. After the first operation the temperature rose to 102 degrees on the first day but fell at once. Eight days after the primary operation, when the wound was reopened to complete the procedure, there was absolutely no pus. In Ballance's case there was semiconsciousness for several days and some tinnitus. In his own case there was some nys-

tagmus for over a week. It was characteristic, toward the left side, indicating that the diseased labyrinth was out of commission. There was so much disturbance of equilibrium prior to operation that the patient walked with a cane, which he had now abandoned.

DR. E. B. DENCH asked if the members had had any experience with

Antistreptococcic Serum in the Treatment of Meningitis.

He employed it, but with no satisfactory results. In all the cases in which he used it the decompression operation had been done. The serum had been obtained from the Board of Health, and their instructions had been followed. He introduced 150 cc. into the vein, and as much into the cord as cerebrospinal fluid drawn out, this being usually 25 cc.

DISCUSSION.

DR. SHEPPARD had injected 10 cc. of the antistreptococcic serum directly into the cranial cavity in one case in which meningitis followed operation upon the mastoid and lateral sinus. Streptococci were found in large quantities in the cerebrospinal fluid. No drainage was used for six or eight hours, then a drain was put in. Forty-eight hours after the first injection another of twenty cc. was made. The patient died, but it seemed as if life had been prolonged. The first serum used was from the Lederle laboratories, the second from Parke, Davis & Company laboratories. The directions called for a small amount.

DR. LUTZ cited a case, previously reported, in which he gave twenty injections of 10 cc. of Parke, Davis & Company's preparation. Two injections were given a day for ten days. The patient recovered. Streptococci were found in the blood. He had used it in four other cases, all of which died.

DR. SHEPPARD added that he was giving the serum under the direction of a pathologist, who said it was the same as the Flexner serum, and that it would be better to put it into the subdural space.

DR. H. A. ALDERTON presented a photograph of

Alveolar Sarcoma

in a child two years old. It followed an attack of what was supposed to be mumps and it proved fatal. A swelling appeared in front of the auricle and two glands become enlarged, one in front and the other behind the auricle. There was some granulation in the canal. He saw the case in consultation with Dr. Fisher, of Bay Ridge, who thought it was suppuration of the lymph glands and advised their removal. This was done, but no pus was found in the glands. The patient was then taken to the hospital for the mastoid operation. The child lived two weeks afterward, and examination showed the disease to be pronounced alveolar sarcoma.

DISCUSSION.

DR. DENCH called attention to the treatment of such cases by means of the "starvation method"—ligating the external carotid artery and its branches. In one case in which he had employed this method the patient made a perfect recovery. This was a case of very malignant melanosarcoma of the external ear.

DR. LUTZ recalled a case, reported twelve years ago, of small spindlecelled sarcoma in a boy twelve years of age. The patient died.

DR. RICHARDS recalled a case, presumably of sarcoma of the middle ear, upon which he had operated five months ago. The extensiveness of the disease, with very slight outward manifestations, was striking. There was total destruction of the tympanum and labyrinth, and the growth was attached to the cerebellar dura. There was a continuous flow of blood, such as would come from the lateral sinus. The patient left the table with a very good pulse, but he died two days later. The extensive bleeding was from the sluiceways in the bone.

DR. EMIL GRUENING said he was asked recently to discuss a paper read before the Obstetrical Society on the subject of

The Advisability of Performing Abortion in Cases of Progressive Deafness.

The reader of the paper stated that many young women hear badly, and when they become pregnant the hearing deterio-

rates very much. He had been approached in one such case, and had promptly delivered the child, feeling perfectly justifiable in doing so. When asked to discuss the paper, Dr. Gruening did not know that abortion had actually been performed in cases of progressive deafness, nor did he know that it had been discussed in otologic literature. Upon looking up the subject he found that very little had been said concerning it. Schwartze, Politzer, Urbantschitsch, and others say very little. All of these authors quote the cases of Dr. Bean. He found that the author quoted had written an article in the *Buffalo Medical Journal,* in 1888, in which he mentioned a woman who in her eighth pregnancy became quite deaf. She had two daughters who had evidently inherited otosclerosis. The subject was discussed at the meeting of the Obstetrical Society from the medical point of view and not from the moral. The conclusion was reached that the operation was not justifiable. A woman, who has otosclerosis, will become deaf, whether she give birth to a child or not. It was asked whether it would be justifiable to sterilize a woman in such case so that she might perform her connubial function without giving birth to children. The speaker thought the question not a debatable one, and he did not debate it. He was surprised to hear the subject discussed. The analogy was suggested between performing abortion to prevent deafness and to prevent blindness. This was a mistake. In the latter case the patient's life is in danger. The abortion is not produced in order to prevent blindness, but to save the patient's life when she is about to die from nephritis. In ear disease the function of the ear is not saved by the abortion, the patient's life is not in danger, and the life of the child need not be sacrificed. He did not know whether the matter had been brought to the attention of other otologists, but to him it was quite new.

DISCUSSION.

Dr. Dench recalled a case in which a woman who had had five children became more and more deaf after the last two pregnancies. He thought it would have been perfectly absurd to produce abortion in order to prevent the progress of the deafness in the mother. To endeavor to prevent it in the child would be another matter, but even here it should be

remembered that a generation is often skipped in the inheritance of any condition.

Dr. Duel thought if there is any question raised in this connection it should be as to whether otosclerotic persons should be allowed to marry at all. Some German otologists think such persons should be forbidden by law to marry. If such a woman is allowed to marry, there would seem to be no moral or legal right to produce abortion, in case she became pregnant.

Dr. Alderton thought the stand taken by Dr. Gruening the correct one, at the same time there was no doubt about these cases growing worse.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, May 23, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

Hemorrhage Into the Labyrinth.

DR. WENDELL C. PHILLIPS reported the case of a young woman, twenty-two years of age, rather under-sized, who, about two months previously, had contracted a severe cold. After considerable physical strain incident to her profession of teaching fancy dancing, she was suddenly seized with tinnitus, followed by nausea, vomiting, headache, and pain in the right ear. The symptoms were sufficiently severe to keep her in bed during the next day. She then became conscious of deafness in the right ear. She had several of these attacks, which completely unfitted her for any kind of labor. She was under the care of a neurologist for a time, when the speaker was called in consultation. When first seen the patient presented all the symptoms of labyrinthine disease, and the diagnosis of hemorrhage into the labyrinth was made. There was no history of specific or constitutional disease.

DR. ROBERT LEWIS reported the case of a boy 3½ years old who had had an

Acute Coryza Followed by Deafness.

He saw the patient ten days after the onset of the deafness. The patient had no elevation of temperature, no pain was present, there was no bulging or redness of the drum membranes. The deafness was pronounced, and both ears were involved. The drum membranes, except for a slight yellowish hue, were normal in appearance; the light cone was present in each drum membrane; the yellow tinge seemed to be due to something in the tympanic cavity shining through the tympanic membrane and which was thought to be pus. Upon incision of both membranes a considerable amount of pus exuded from both middle ear cavities. There was a marked

hypertrophy of both the pharyngeal and faucial tonsils and they were excised. The patient made a quick and complete recovery.

DISCUSSION.

DR. DENCH asked if the discharge from the ear had ceased, to which Dr. Lewis replied that it had not. He had operated only recently, curetting the cavity.

DR. GRUENING recalled a patient whom he had seen two years ago at St. Vincent's Hospital. The man had otitis media of several months' duration, for which he had been under treatment by a specialist for some time. The speaker advised the mastoid operation. Dr. Lewis, however, only removed a part of the drumhead, the patient meanwhile drinking some of the water of Lourdes. He recovered. The patient attributed his recovery to the water of Lourdes.

Dr. Gruening said it is not uncommon in young children to find otitis media purulenta which presents none of the usual symptoms. He had seen it in young patients who did not seem to suffer and in whom the usual symptoms of the condition are lacking. In such cases the drum membrane usually presents a gray appearance, but the landmarks are lost. Incision frequently reveals pus. He called attention to the fact that there might be pus without the presence of microorganisms. This is sometimes found in the anterior chamber of the eye, and perhaps also in the tympanic cavity. It would have been interesting to know the character of the pus in the case reported.

DR. DENCH thought the persistence of discharge for six years indicated radical operation, inasmuch as there was apt to be sufficient destruction in the tympanic cavity to preclude the possibility of relief by exploration of the cavity. The tendency was to delay radical operation too long. Several years ago he had advocated ossiculectomy, several of his cases having done very well under this treatment, but now, with improved technic, with primary skin grafting, and with the good results in hearing he preferred the radical operation. In a case such as that which Dr. Lewis had reported he would hardly hope for improvement by any other procedure than radical operation.

Dr. Dench recalled a case similar to that reported by Dr. Lewis, except that there was tenderness in the neck. Both

drum membranes were incised. A probe passed into the tympanic cavity revealed the presence of the streptococcus capsulatus. Both mastoids were extensively involved.

Dr. Dench thought the chief fault at the present time is the attachment of too much importance to the radical mastoid operation. He did not consider it as dangerous as the extraction of the ossicles through the external auditory meatus. He had obtained as good results by this means as by ossiculectomy. Of course there is danger of facial paralysis following the radical operation, but he had had as many cases of facial paralysis following ossiculectomy as following the radical mastoid operation. He considered the radical operation a great deal safer in chronic suppuration than the socalled simpler procedure. This was contrary to what was taught fifteen years ago. As a general procedure the radical operation was indicated, and in a case which had persisted for six years it certainly was the method of choice.

Dr Lewis, in closing the discussion, said the drum membranes looked so nearly normal that he hesitated about incising them. The discharge continued a week after incision.

Malleus Lying Free in the Tympanic Cavity.

Dr. Robert Lewis reported a rather unique case. The patient, a boy, had had a slight but malodorous discharge from both ears for about six years. On the right side there was a pinhole perforation in the center of the drum membrane. The lower half of the membrane was removed for the purpose of examining the middle ear to determine the cause of the discharge.

On examination of the tympanic cavity with a probe a hard substance was found on the floor of the cavity. This was removed by means of a forceps and was found to be the malleus, intact and without even an erosion on its surface at any point; it was lying free across the floor of the middle ear.

Upon removal of the entire drum membrane it was found that the incus was missing. The presumption that the patient had had an acute purulent otitis media some years before, that this had become chronic, and that the incus had sloughed away, the malleus falling down into the cavity, and the drum membrane reforming except for the small perforation. There were some granulations present.

DISCUSSION.

DR. PHILLIPS did not consider it an unusual thing to find a wholly or partially dislodged malleus in the tympanic cavity. In his experience such findings were in tuberculous patients.

DR. KENEFICK asked if the patient had had scarlet fever. He had seen two cases in eight years in which the malleus had fallen into the canal, in each case following scarlet fever and acute middle ear suppuration.

DR. DENCH had not seen many such cases. Where there is sufficient caries to destroy the malleus and make it assume the role of a foreign body in the tympanic cavity, it is only logical to assume that there is extensive suppuration in the tympanic vault. The blood supply of the malleus is good, whereas that of the incus is poor; it would therefore be less remarkable for the latter ossicle to become detached.

DR. LEWIS, in closing the discussion, agreed with Dr. Dench that it would be advisable to resort to the radical mastoid operation in such a case if there were present a carious condition of the ossicles. He did not consider this condition present in the case under discussion. The history of the case was obscure. The patient had had measles, but he was not sure about scarlet fever. He could not see how the malleus could have fallen down unless the tympanum had sloughed away and then reformed with the exception of the small perforation.

DR. J. A. KENEFICK referred to a paper which had recently been presented before the Otological Section of the Academy of Medicine which dealt with the

Relation of Dental Lesions to Aural Affections.

The author of the paper cited a case of persistent pain in the mastoid region, in which operation was resorted to, and in which radiographs revealed the cause of the trouble as non-erupted teeth improperly placed. Other radiographs were presented which were quite instructive from the aurist's point of view.

DISCUSSION.

DR. DENCH thought there was a tendency to confuse dental otalgia with an inflammatory condition of the geniculate gan-

glion. It was possible to have herpes zoster without any eruption at all. In all cases of obscure pain in the mastoid the aurist should bear in mind possible dental lesions. In the absence of any dental lesion, such as unerupted or misplaced teeth, these cases of otalgia fall under the head of herpes without eruption, or of primary neuritis of the auditory or facial nerves, or of the geniculate ganglion. The only remedy was to sever the nerve instead of extirpating the ganglion.

DR. GRUENING thought separation of the nerve, as suggested by Dr. Dench, should be the very last consideration. Sometimes pain in the nose or throat radiates to the ear. Cocainization of the nose or throat will often relieve the pain; if not, the patient should be sent to the dentist.

DR. LUTZ had had two cases during the winter of dental otalgia, which were suggested by Dr. Kenefick's allusion to the relation of dental lesions to aural affections. About Christmas a woman had consulted him for earache. She had had no toothache, and so far as he could see there was nothing the matter with her. In looking over her teeth he found one tooth which had been capped. When questioned about it she said it was sometimes sensitive to heat and cold. He sent her back to the dentist, who said there was nothing the matter with the tooth, and who maintained that the trouble must be in the ear. The speaker then had a radiogram of the tooth made, which revealed suppuration at the root. When this was attended to the pain ceased.

In another instance a young girl complained of earache, some of the pain being in front of the ear, but most of it inside the ear. She presented some of the symptoms of mastoiditis. The trouble was found to be dental otalgia, traceable to a capped tooth. Such cases are fairly common.

DR. DUEL was inclined to think that the otalgia in the cases cited by Dr. Dench should not have been attributed to the nerve until a more careful examination of the teeth had been made. He had had a case of severe double otalgia in which examination of the ear revealed nothing. The patient had had a good deal of crown and bridge work done, but, after a careful examination, the dentist reported that everything was in good condition in the mouth. Radiographs were then made, which showed that there were two misplaced wisdom teeth. These were removed and the pain ceased.

Dr. Kerrison, referring to the radiographs mentioned by Dr. Kenefick, said that a great many had shown abscesses at the roots of the teeth. Others showed only teeth abnormally placed, i. e., teeth growing laterally, or at right angles to the other teeth. The practical point for otologists is that in cases of obscure aural symptoms radiographs will often show dental lesions or abnormalities which are not revealed by the usual direct examination of the mouth either by aurist or dentist.

Dr. Sheppard said there are some cases in which the radiograph shows nothing, as where an exostosis presses upon the dental nerve.

Dr. Lutz said it is not difficult to trace otalgia in cases of acute tonsillitis or some other evident trouble, but in the instances which he cited the teeth were not thought of until other conditions had been carefully looked for. He had had a case of otalgia which was traceable to sphenoid disease. As soon as the sphenoid was clear out the otalgia subsided.

Dr. Kenefick suggested, in closing the discussion, that it would be a good idea to have the paper to which he had referred, with the exhibition of radiographs, repeated in the fall. The pictures showed the various conditions of the teeth which might give rise to otalgia. Dentists were inclined to think that when the nerve of a tooth is dead it can give no trouble. This is not necessarily true, for the preparation of the tooth may have been defective, particulaly if done some years ago.

Dr. James F. McKernon said the use of

Urotropin in the Treatment of Purulent Meningitis

was first brought to his attention by Dr. Cushing, of Baltimore. He suggested its introduction into the spinal canal. After withdrawing the cerebrospinal fluid he introduced fifty grains of urotropin in from 15 to 20 cc. of normal salt solution. There was a marked drop in the temperature within four hours after the injection. The streptococcus, he says, will not live in the presence of a concentrated solution of urotropin. The speaker had employed the method in three cases, which he had not reported because of insufficient data. The results, however, were sufficiently encouraging to make him believe that it is of distinct advantage in the treatment

of purulent meningitis. Whether the improvement was coincident in these three cases, or due to the urotropin, he could not say. Each case presented the classical symptoms of purulent meningitis. In two there was complete coma until the urotropin was injected. Several hours after the injection consciousness returned. He had mentioned this in the discussion of Dr. Crockett's paper, two years ago, and suggested that the method should be tried, but he had made no formal report because he felt that the results should be verified by a large number of cases.

Dr. McKernon added that in the first two cases treated with urotropin he had used only 30 grains. While this dose had some effect upon the temperature it was not comparable to the effect of the large dose subsequently employed.

DISCUSSION.

DR. DENCH considered the introduction of urotropin in the treatment of meningitis a distinct advance. He had used the antistreptococcic serum without result. He had employed it in doses as high as 150 cc., by injection into the spinal cord and also intravenously, but with no favorable effect. In his experience patients with otitic cerebrospinal meningitis usually die.

Dr. Dench thought the cases very interesting. He had used urotropin internally in some cases, but had never injected it into the canal. He had also used it as a prophylactic measure in section of the auditory nerve. Cushing gives it internally in all brain operations.

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

Intracranial Murmurs in Their Relation to Tinnitus Aurium.

HYSLOP, London (*Lancet*, October 14, 1911, p. 1062). In the Hunterian lecture for this year Prof. Hyslop discusses the above subject and shows on anatomic and physiologic grounds how some of the severest forms of tinnitus may have their origin within the cranium and independent of any direct disease of the auditory apparatus. Most of these murmurs have to do with movements of the brain itself and the abnormal conditions of the blood vessels. Many can be directly auscultated, and although present knowledge gives little hope of relief from the unbearable noises, it is hoped that a better understanding of the matter will lead to an ultimate solution of the trouble. It is a question which specialists should carefully study in order to be able to differentiate at once the incurable forms from those which fall directly in his specialty and capable of some amelioration. *Horn.*

Acute Middle Ear and Mastoid Inflammations. The Relations of Active Autointoxications.

SNOW, London (*Lancet*, October 14, 1911), considers that much can be done in hastening the healing of mastoid inflammations by internal measures. "The whole question of local congestion revolves around and rests upon the state of glandular activities. If the antibodies, nature's army of opsonins, are in normal quantities and in normal activity they fight down and keep in subjection bacteria that are always ready somewhere in our economy for pernicious development." We should always be on the outlook for stored up toxins. The tonsils, the accessory sinuses, or the tympanic cavities may harbor staphylococci, streptococci or any other bacteria, opposed as he terms them by a few attenuated antibodies. His method of combating these invaders is principally by means of small divided doses of calomel, which he considers the greatest of alteratives. Since adopting this line of treatment his patients recover in one-half the time they formerly did

and with one-third the effort. A method such as this certainly deserves trial, especially for those who have not used it as a routine treatment for years past. *Horn.*

Results in Treatment of Thirty Cases of Otitis Media by Vaccine Therapy.

C. L. McDonald (*Jour. Amer. Med. Asso.*, June 3, 1911) reports thirty cases of subacute and chronic otitis media treated with vaccine, with, in the main, good results.

In nine cases he found a short, actively motile bacillus, which grew readily on any media, and was negative to Gram's stain. The culture of this bacillus had a very foul odor, similar to the odor of the discharge from the ears. The cases in which this organism was present showed little or no improvement after a course of seven or eight inoculations. In cases in which the staphylococcus, streptococcus or pneumococcus were the causative organisms, either alone or combined, the patients were markedly improved or entirely cured. Cases in which the staphylococcus and bacillus pyocyaneus were present improved more slowly than those with the staphylococcus alone.

In conclusion, he felt safe in saying that in subacute otitis media, no other means of treatment is capable of producing such uniformly good results as vaccines. Their early use would greatly diminish the large number of chronic cases so common to every physician and so annoying to the individual. *Richards.*

Use of Fibrolysin in Fibrosis of the Middle Ear.

Macleod Yearsley (*Jour. Laryngology*, May, 1911). Thiosanin and its derivative, fibrolysin, appears to possess a peculiar property of softening cicatricial tissue, causing an edema in this tissue with swelling up and dissociation of the fibers and softening. This action does not occur in healthy tissue unless therapeutic doses are exceeded. It softens cicatricial tissue, but does not destroy it. Its effect is rapid, but of passing character, and it can only be an auxiliary to mechanical treatment. Although stated to be an inoffensive agent, it has been attended in a number of instances with untoward results.

Its use was proposed in 1897 in otology for cases of adhesive otitis, with varying results from different observers,

vaunted by some, condemned by others. Yearsley gives careful clinical histories of twenty cases, seven males, thirteen females, in which he used the remedy with improvement. In three there was no improvement, in sixteen the results were doubtful. Seventeen cases had tinnitus, but only in two cases was it improved by treatment. The author has doubt even about the action of the fibrolysin in those cases which he reports improved.

He concludes that whatever may be its effect upon cicatricial tissue elsewhere, it has no action upon pathologic fibrosis in the middle ear. *Richards.*

Otosclerosis.

GUSTAVE BRUHL (*Journal of Laryngology*, June, 1911) considers the best name for the lesion present in otosclerosis to be "spongy hyperostosis" in the oval window.

We come now to consider why it is that the bone in the neighborhood of the stapes is so liable to this transformation. Are there any conditions in this region which favor such a change?

In order to elucidate these problems he submitted his preparations to Prof. Gebhardt, the well-known authority upon transformations of bone. His opinion agreed with that of Bruhl, viz., that the changes in the bone which lead to the typical ankylosis of the stapes are the result of the action of forces of traction and compression. The neighborhood of the articulation of the stapes is a likely spot for the development of proliferation in the bone for the following reasons: Immediately in front of the oval window the tendon of the tensor tympani passes over the "arciform fasciculus" on its way to the malleus; secondly, the movement of the stapes is more extensive in the anterior than in the posterior pole of the oval window. The continual pulling of the tendon, together with the friction of the footplate of the stapes on the anterior border of the foramen ovale, produces an incessant movement of the periosteum and an irritation of the bone lying between the tendon and the angular ligament of the stapes. The cartilaginous covering of, and the cartilaginous residua in the bone at this place render it very liable to transformation. To sum up, the traction and friction induce hyperemia and a tendency to proliferative processes in the periosteum and in the bone.

As a rule, the formation of hyperostosis remains limited to the oval window, but in some varieties isolated areas of transformed bone may also be found elsewhere in the capsule of the labyrinth. In such cases the focus in the vicinity of the stapes is the oldest. We may, therefore, assume that the production of the diffused foci is set agoing by the initial deposit at the oval window. *Richards.*

Operation for Aural Vertigo.

RICHARD LAKE (*Lancet*, June 10, 1911). It is better from all points of view to restrict the term Meniere's disease to an apoplexy of the labyrinth due to leucemia and allied conditions of the blood. For this reason also it is better to consider the great majority of cases in which giddiness arises from disease of the internal ear as aural vertigo.

Lake has operated upon ten cases of aural vertigo since 1904, four cases of which have been previously reported. None of them were connected with suppurative processes. The operation is done in those cases which have none or only a slight degree of hearing, which the patient is ready to sacrifice, provided that relief is obtained from vertigo.

For details of the technic the reader is referred to the text books of otology.

The labyrinth should be opened both above and below the facial nerve. Injury to the facial nerve is not an uncommon complication. Unless the facial nerve itself has been injured, complete recovery will follow. Injury to the facial nerve, the author thinks, is due to faulty technic on the part of the operator. In the cases reported the relief justified the operation, and the author thinks that relief may be promised.

Relief may be promised with certainty in those cases of aural vertigo, which must otherwise render life a burden to the sufferer, by an operation which in itself has no risk to life. The slight risk of a temporary facial paralysis does not in reality require a passing thought; the hearing is the only important factor. It is not too much to say that where the cochlear division of the eighth nerve is relatively intact, no operation should be considered, unless one is able to demonstrate without a shadow of doubt that the vertigo is of purely aural origin. And this is a combination which in all probability does not exist. Vertigo of other than aural origin is usually

accompanied by at least fairly good hearing. But whatever perception of sound the patient may have in the diseased ear will almost for a certainty be destroyed by the operation, and the question for the patient to consider is whether he will sacrifice the vestige of hearing which he still retains, in order to obtain relief from vertigo. But in those cases where the hearing of the diseased ear is lost, there can be no question whatever of the propriety of the operation or of its successful issue. And when vertigo or nystagmus, or nystagmus without vertigo, remains or is present for more than, at the outside, ten days after the operation, then we may assume that the operation has not been as complete as it should be, although the ultimate results will be quite satisfactory.

Richards.

Labyrinthitis.

URBANTSCHITCH (*Wiener medizinische Wochenschrift,* No. 41, 1911) states that from a prognostic, therapeutic and differential diagnostic standpoint, it is of the greatest importance to distinguish the serous forms of inflammation of the labyrinth from the purulent.

In the Vienna clinic a labyrinth operation is only permitted when the function of the cochlear and vestibular apparatus has been destroyed.

A case reported by Ruttin demonstrates the importance of this. Five days after a radical mastoid operation had been performed, labyrinth symptoms, fever, complete deafness, and a severe spontaneous nystagmus, developed. The function of the vestibular nystagmus, as shown by the caloric test, had not however completely disappeared. This one indication induced Ruttin to put off the labyrinth operation, and the subsequent history of the case proved that he was right, because while the deafness persisted, the vestibular reaction returned and remained normal.

The same author in another article mentions the importance, when a labyrinth suppuration has been diagnosed, of operating immediately, at the same time the radical mastoid operation is performed, and not waiting to see what the result of the mostoid operation is going to be. If this procedure is not followed, a rapidly developing meningitis may render the operation hopeless.

Circumscribed inflammations of the labyrinth do not per se

indicate any special surgical interference. There are many cases in which the wall which separates the middle ear from the labyrinth has been partly destroyed by a labyrinth suppuration. In such cases, a labyrinth fistula exists, and many of these get well after the middle ear cavities are opened up. It is remarkable that a labyrinth fistula may go along without any symptoms.

Barany describes a case of this kind, which in six weeks went on to a complete destruction of the labyrinth, without any labyrinth symptoms, such as dizziness and nystagmus, being present during the entire course of the disease.

It was formerly believed that when a suppuration of part of the labyrinth existed, the other parts of this organ must also be involved, but Herzog has lately been able to demonstrate that a true circumscribed, purulent labyrinthitis could exist. Purulent inflammations of the labyrinth occasionally get well spontaneously.

Marx has reported the histologic findings in a patient who had died of a croupus pneumonia, in whom a purulent labyrinthitis in the process of healing, was found. *Theisen.*

The Treatment of Suppurative Otitis Media by Bacterial Vaccines.

W. G. WESTON AND J. A. KOLMER (*Jour. Amer. Med. Asso.*, April 15, 1911) have treated, with bacterial vaccines, a large number of cases of suppurative otitis media following scarlet fever. Of 2,537 patients, 308 or 8.2 per cent, developed suppurative otitis media. One hundred cases extended over a period of nine months, and were treated with autogenous vaccine with good results, the period of the discharge being considerably diminished.

Staphylococcus aureus was found alone in 14 cases.

Staphylococcus albus was found alone in 2 cases.

Bacillus pseudodiphtheriæ was found alone in 35 cases.

Bacillus pyocyaneus was found alone in 20 cases.

Streptococcus pyogenes was found alone in 4 cases.

Staphylococcus aureus and B. pseudodiphtheriæ were found together in 9 cases.

Streptococcus pyogenes and B. pseudodiphtheriæ were found together in 4 cases.

Bacillus pyocyaneus and B. pseudodiphtheriæ were found together in 9 cases.

Streptococcus pyogenes and B. pyocyaneus were found together in 3 cases.

If no improvement was noted after the third dose of vaccine, or if ten days elapsed before vaccine could be administered to a case after culture had been taken, a reculture was made and a new vaccine prepared.

The initial dose for the average patient 10 years of age was about as follows:

Staphylococcus aureus and albus, 15 to 40 millions.

Bacillus pseudodiphtheriæ, 35 to 50 millions.

Streptococcus pyogenes, 5 to 10 millions.

Bacillus pyocyaneus, 50 to 80 millions.

It is well to give a small dose at first and note the extent of the reaction. This reaction will be a good guide for determining the size of the succeeding dose. Doses repeated every fiv to eight days.

Following the administration the majority of patients develop a temperature varying from 100 to 102 F. in about eight hours, gradually reaching normal in twenty-four to thirty-six hours. "We have seen the temperature fall a degree or so to subnormal after an injection, reaching normal at the end of twenty-four hours. A second dose should not produce so much fever, and when doses are properly selected the temperature reactions are quite conspicuous, each being lower than the preceding, as the patient's system is charged with an increasing quantity of opsonins, until finally no fever follows the administration. The local reaction is usually quite typical. If one has succeeded in securing the organisms producing the infection, its vaccine will produce an increased amount of discharge for twenty-four to thirty-six hours. This is of good prognostic value. The discharge may gradually diminish in amount or cease suddenly and entirely. The general improvement in health in many of the patients was indeed striking. In addition to the temperature and local reaction, the patient, if old enough to express himself, will sometimes complain of lassitude, sleepiness, slight headache, etc. We have been fortunate enough to escape abscess formation."

Under vaccine treatment 21.99 per cent of cases are cured in from one to thirty days, as compared with 7.46 per cent under usual treatment in the same period of time.

During this work the following are considered as contra-indications to the administration of vaccines:

1. Cases of continued fever.
2. Acute nephritis.
3. The occurrence of other infections means cessation of vaccine treatment.

The Technic.—The ear is cleansed of the excess of secretion by means of probe and cotton, and then a culture is made in sterile bouillon by means of a sterile swab. This culture is then plated out by inoculating the water of condensation in successive large tubes of plain or gelatin-agar. This water is run once over the surface of the media. In twenty-four hours the colonies are well developed and usually well isolated. They are examined microscopically and subcultures made on large tubes or bottles of slanted agar. If the streptococcus was being cultured glucose-gelatin-agar was used. At the end of twenty-four hours the culture is examined microscopically for purity and morphologic characteristics of the organisms; subcultures are made on various media, and in case a diphtheria-like bacillus is present a toxin is prepared by growing for forty-eight hours in alkaline (0.5 per cent phenolphthalein) bouillon to which is added one per cent glucose. This is administered, unfiltered, subcutaneously into the abdominal wall of a 250-gm. guinea pig, the dose being 0.5 per cent of the body weight expressed in cubic centimeters. The cultures are washed off the surface of the medium with sterile normal salt solution, diluted with the same solution, and counted by comparing the number of bacteria with human blood as a standard. For staining these slides it is very essential that the stain employed produces no precipitate. We used, and can warmly endorse, the method consisting of fixation for five minutes in a saturated solution of bichlorid of mercury, followed by washing and immersion in a solution of carbolthionin for a few minutes. After counting, the emulsion is sealed in a drawn out test tube and heated in a water bath, fully immersed, for one hour at 58 to 60 C., never over 60. The tubes are then opened and cultures made on slanted agar. *Richards.*

II.—NOSE.

Relation of Nasal Obstruction to Articulatory Capacity in Children.

ERNEST JONES (*Brit. Jour. Children's Diseases,* June, 1911) has found that in average school children (469 cases, 106,500 tests) the articulatory capacity for consonants is found to vary with the degree of nasal obstruction. The dependence of the capacity on this factor is not very close, but is more decided with boys than with girls.

In children with gross articulatory defect or dyslalia (231 cases, 52,000 tests) no correlation whatever was found between the extent of this defect and the degree of nasal obstruction present. *Richards.*

Lupus in the Interior of the Nose.

S. A. PFANNENSTEIL (*Berl. klin. Woch.,* January 23, 1911). Lupus of the interior of the nose is treated by Strandberg of Copenhagen after the method of Pfannensteil, the theory of which is that the bacteria in tubercular tissue could be destroyed and the ulceration healed if it were possible to introduce a bactericidal body directly into the diseased tissue. To achieve this, sodium iodid is given by mouth, and peroxid of hydrogen is brought into contact with the tissue locally.

The patient is given daily three grams (45 grains) of iodid soda, divided into six doses. At the same time, the nose is filled with absorbent gauze, moistened with peroxid of hydrogen, a tampon being inserted every morning, and by means of a pipette the patient keeps it continually moist with peroxid of hydrogen. The tampon must be so applied as to be in absolute contact with all the diseased area.

Of thirteen cases so treated all but one showed good results, and in nine all symptoms disappeared. Duration of after-treatment given varies from five days to three months. *Richards.*

Scab Formation in Nose.

W. PEYRE PORCHER (*New York Medical Journal,* August 26, 1911) believes that coagulation of the nasal secretions, or scab formation, occurs as a result of the inflammatory secretions of the lateral sinuses coming in contact with respired air. This is assured, as evidenced by the fact that inflamma-

tory secretions from a tracheotomy wound, or any other wound of the upper respiratory tract, coming in contact with the external air, will produce the same coagulation, or scab formation.

From this he infers that free outlet should be given to all pent-up secretions in the lateral sinuses, and that then such remedy should be administered as will maintain the fluidity of the nasal secretions as well as correct inflammatory conditions producing them.

He has found potassium iodid, in gradually increasing doses up to a large amount, to produce this result better than any other drug, and in the great majority of his cases the results have been permanent.

If results are not produced at first, the ethmoidal cells are cleaned out as much as possible, the iodid is pushed, with the result that the scabs usually cease forming, and the odor stops.

Richards.

Prophylactic Inoculation Against Hay Fever.

L. Noon (*Lancet,* June 10, 1911) at the laboratory of St. Mary's Hospital has been experimenting with prophylactic inoculations against hay fever. The condition of hay fever is considered as due to pollen toxin, and the theory of Dunbar is sustained. The results with Dunbar's pollartin are, however, only moderately good, cures being obtained only in exceptional cases. A pollen serum is prepared after the method of Dunbar, by extraction with distilled water, aided by freezing and thawing several times. The extracts were then sealed and boiled. Timothy grass was found to yield the most active extract. One gramme of this pollen was extracted with 50 cc. of water. One drop of a 5,000 fold dilution of this extract is sufficient to excite a distinct reaction in the conjunctiva of the more sensitive patients. The patient's resistance is measured by observing the strength of pollen extract necessary to excite a conjunctival reaction. Sensitive patients react to four units, while normal individuals fail to react with 2,000 units.

The unit is the quantity of pollen toxin which can be extracted from the thousandth part of a milligram of phleum (timothy pollen). The patients were immunized by subcutaneous injections of pollen extract. With minute doses the

resistance of the patients rose rapidly, then as the dose increased the resistance ceased to rise, and even went back towards its original value. Ultimately a stage is reached at which the resistance ceases to rise.

The result of these experiments so far is to show that the sensibility of hay fever patients may be decreased, by properly directed dosage, at least a hundred fold, while excessive or too frequent inoculations only serve to increase the sensibility. It still remains to be seen whether the immunity thus attained is sufficient to carry the patients through a season without suffering from their annual attacks of hay fever. Patients are under observation who have undergone treatment for periods varying from a few weeks to eight months.

Richards.

Transplantation of Bone for Correction of Depressed Deformities of the Nose.

Wm. W. Carter (*Jour. Amer. Med. Asso.*, April 29, 1911). For cases in which a large part of the bone framework of the nose has been destroyed, Carter transplants a piece of rib properly shaped directly against the side of the defect, the soft parts in the periosteum overlying the bone being first separated so as to admit of its introduction. The piece of cartilage is taken from the middle of the ninth rib where the muscular covering is very thin. The patient is caused no inconvenience, and the resected portion is quickly reconstructed from the periosteum.

When the bone is split and the cancellous tissue removed the strips of compact bone can be easily shaped to suit the deformity, and, if the occasion demands it, several layers of this bone can be superimposed. It is necessary to remove the cancellous tissue, as this does not add to the vitality of the graft. In cases in which implantation has been made for defects in the long bones, and the medullary tissue has not been removed, it has caused an irritation and aseptic fever.

The detailed technic is as follows: The skin over the nose and over the ninth rib on the right side is prepared for an aseptic operation; a short transverse incision is made down to the bone at the nasofrontal suture. Through this incision the skin and subcutaneous tissue over the dorsum of the nose are elevated with a long, thin, two-edged knife, curved on the flat. Above this incision the tissues, including the perios-

teum, are elevated for about three-eighths of an inch. This wound is covered with sterile gauze. The ninth rib at about its middle is then exposed for two inches and shelled out of the periosteum and removed. "I then split this section of rib in its transverse diameter, scrape off its medullary portion and shape one of the strips of bone to suit the deformity. This is then inserted into the wound in the nose, previously made for its reception, care being taken to insert the upper end under the periosteum over the nasofrontal process. Both wounds are then irrigated with sterile salt solution, closed with silk sutures, and sterile dressings applied. The dressings are changed for the first time on the seventh day, and the sutures removed two days later." *Richards.*

A Contribution to the Question of Ozena.

J. S. Fraser and F. E. Reynolds (*Jour. Laryngology,* April, 1911) from a careful study of 138 cases of ozena, at the Royal Infirmary of Edinburgh, have reached the following conclusions as to its pathology and etiology:

1. No clear line of demarkation can be drawn between chronic purulent rhinitis and ozena. 2. Chronic purulent rhinitis (ozena) usually begins early in life as a hypertrophic catarrh of the nasal mucous membrane; the inferior turbinal is most severely affected, and has frequently gone on to atrophy while the middle turbinal is still in the hypertrophic stage. 3. The most common causes are the exanthemata, coryza in infants, and syphilis. 4. Chronic purulent rhinitis leads to various changes in the nasal mucosa, notably metaplasia of large areas of the superficial ciliated epithelium into squamous epithelium; dense, small celled infiltration of the submucous tissue (most marked in the superficial layers); catarrhal changes in, and atrophy of, the mucous glands; diminution in size and number of the cavernous blood spaces. In many cases there is atrophy of the turbinal bones, especially of the inferior turbinal. In some cases there is arterial disease, and in the majority of cases there is sclerosis of the deeper layers of the submucous tissue. These changes have their counterparts in the mucous membrane of the accessory sinuses in certain cases of chronic suppuration, in the middle ear cleft in certain cases of chronic suppurative otitis with cholesteatoma formation, and in the bronchi in such conditions as chronic puru-

lent bronchitis and bronchiectasis. 5. Various microorganisms give rise to the first stage of ozena, i. e., to acute and subacute purulent rhinitis, micrococcus catarrhalis, pneumococcus, staphylococci and streptococci, etc. The characteristic picture of ozena is probably only produced when the bacillus mucosus ozenæ is present. 6. Ozena is more likely to develop in a congenitally roomy nose than in a narrow one, on account of the greater tendency in the former to stagnation and consequent putrefaction of the secretions. 7. Atrophy of the nasal tissue may be due to the pressure of the crusts and to vascular or sclerotic changes, but is probably mainly due to toxic influences. 8. Tubercle and syphilis are concerned in the production of ozena, in that they may lead to chronic purulent rhinitis. 9. Accessory sinus suppuration is not the cause of ozena, though it not infrequently complicates this condition. 10. It is clearly established that ozena not infrequently occurs in several members of the same family, and there are some grounds for regarding it as a contagious disease. 11. Those who support the "primary bone disease" theory in regard to the causation of ozena have not shown that changes in the bone precede those in the mucous membrane; a lowered state of general health and neglect of treatment have probably more to do with the transition of purulent rhinitis into ozena than "congenital tissue weakness." No treatment is given. This is a study in etiology only. *Richards.*

Chronic Nasal Stenosis and Collapse Induration (Kroenig) of the Right Pulmonary Apex.

MAX ROSENBERG (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reviews the literature of Kroenig's socalled collapse induration, and considers that it is dependent in the majority of cases upon chronic nasal stenosis or hypertrophy of the adenoid. The apices under normal conditions are almost atelectatic through their insufficient ventilation, especially before puberty. Chronic nasal stenosis brings about the entrance of irritating air into the lungs, giving rise to inflammation and occlusion of the smaller bronchial tubes. The natural result of this repeated inflammation is atelectasis from occlusion and fibrous induration. Such patients are also especially predisposed by anomaly of constitution to

diseases of the respiratory mucous membrane. The apices are especially endangered, and all parts of the lungs, since in the first place their ventilation is deficient, so that they incline readily to formation of atelectases, and an especially large quantity of dust particles takes place, since they are deficient in the agencies which carry away dust from the other portions of the lungs. Futhermore they are so unfortunately situated that they receive partially the dust which is carried away from the lower lobes, and are not able to get rid of it. In cases of stenotic dyspnea the lower portion of the lungs draw down by force a portion of the alveolar air from the apices, which tends to increase the atelectasis.

The right apex is more frequently affected than the left, since much more dust reaches the right apex than the left. This predisposition is increased by differences in calibre, the course and points of departure of the bronchial tubes. In fifty cases of chronic nasal stenosis the author found eighteen cases of collapseinduration. The importance of collapse-induration to tuberculosis is very great, and the recognition of a possible predisposing factor in nasal stenosis should not be overlooked. *Goodale.*

Median Nasal Fistula.

H. STREIT (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3). An 8-year-old boy exhibited a median fistula on the nose, originating from a tumor, which had been imperfectly extirpated. Histologic examination showed a lining of thick epidermis, containing numerous hairs, with sebaceous glands and sweat glands. The author considers the case one of dermoid cyst, transformed by operation into a fistula. Complete extirpation was done without recurrence.

Goodale.

Treatment of the Inflammatory Affections of the Accessory Sinuses.

GUSTAV KILLIAN (*Deutsche medizinische Wochenschrift,* August 20, 1911) treats acute inflammations of the sinuses by inducing active hyperemia with an electric light bath. The apparatus, first constructed by Brunings, consists of a box which, with the patient in a recumbent position, is placed over his head. In the interior are four electric lamps, so set that their rays are directed against the patient's face. The eyes are protected by a heavy leather eye shade, and layers of

gauze if needed. A glass tube is provided for breathing through the mouth the outside air. This air is moistened. The current is first turned on two lamps, then on four, the temperature rising up to 60, 70, 75, 80° C. The patient remains in the bath ten minutes. First, two lamps are turned out, then two more, and the temperature slowly goes down to room temperature. Treatment is given once or twice or three times daily. The pain is relieved, and Killian considers the results excellent. Sodium iodid to increase the secretion and aspirin for the pain are given at the same time. Complete healing occurs in one or two weeks.

Killian gives the technic of his radical operation as follows. It is to be employed only for chronic cases:

General anesthesia is always used, and careful incision is made in the eyebrow, and is carried on to the side of the root of the nose, along the frontal process of the upper jaw, down to the lower border of the nasal bone. The skin and periosteum above and below the incision over the orbit are separated. This separation is carried into the orbit as far as the tear canal, and to the paper plate of the orbit. The tear sac is separated from its attachment, the whole lower border of the frontal sinus laid bare as far as it is possible to do so. The resection of the anterior wall of the frontal sinus, the frontal process of the superior maxilla, the tear bone and, when necessary, a portion of the paper plate as well as the entire floor of the frontal sinus follows. Only the upper border of the orbit remains in the form of a bridge of bone. The mucous membrane is carefully removed from every crevice and furrow. The anterior middle and, when necessary, the posterior ethmoid cells are curetted with a sharp spoon so as to form them into a single, smooth-walled cavity, the mucous membrane of which has been removed, and which opens with a wide opening into the nose.

If the sphenoid sinus is diseased, its cavity is widely opened and curetted. The anterior portion of the middle turbinate is drained and cut off, as well as all the mucous membrane which covers the frontal process. The entire cavity is washed out with peroxid of hydrogen in the region of the ethmoid cells, and a piece of rubber sponge is laid which reaches to the choanæ of the nose. This tampon is removed on the next day. The skin is sutured on the third or fourth day. Only

in the presence of simple mucous catarrh is primary suturing done. Often it is necessary to operate on the antrum and frontal sinus at the same time, in which case the antrum is operated upon first.

Several deaths have followed this operation on the frontal sinus. These cases have been due either to fatal complications which were already present before the operation, or they have been due to failures in technic.

The region of the olfactory fissure has not been sufficiently protected. This is very necessary, since the fibers of the olfactory nerve are accompanied with lymph vessels which are in direct connection with the subdural spaces. For this reason virulent pus can very easily infect the opened fissures, and in this case a purulent meningitis is likely to rapidly follow. Occasionally osteomyelitis of the skull bone is to be laid to the tearing of the primary suturing, and is easily avoided by the secondary suturing.

Careful attention must be given to the supraorbital nerve. If this is in the cicatrix neuralgia may be produced, which is only avoided by an additional resection of the nerve. The operation is not to be done if the patient suffers from ozena.

Richards.

Complicated Cases of Disease of the Accessory Sinuses.

W. UFFENORDE (*Zeitschrift fuer Laryngologie,* Bd. III., S. 597, 1911) reports twelve cases of acute retrobulbar optic neuritis that all originated in conjunction with an acute inflammation of the accessory sinuses. Even if examination of the nose in such cases does not show anything very abnormal, the author believes that, particularly if the history of the case shows a previous rhinitis, a closer connection between the affection of the eye and nose must be thought of. The author bases his report on thirty-seven cases of affections of the accessory sinuses, coming under his observation in the Göttingen Clinic.

The disturbance of vision in his cases, the author believes, were caused by a stasis of vessels and a perineural edema of the optic nerve. The nasal treatment consisted in reduction of the middle turbinate, and the use of a powder of boric acid, menthol and cocain, which was snuffed up the nose.

The author reports cases of orbital phlegmons resulting

from an acute or chronic suppuration in the frontal sinus or ethmoid cells.

Disease of the ethmoid cells causes more orbital complications than disease of the frontal sinus. The report of the case of a woman, aged thirtty-nine years, is given, in whom gradually a total paralysis of the right eye muscles developed without exophthalmos. During the operation necrotic masses were found in the posterior ethmoid cells and sphenoid sinus. Iodid of potash was given, but without result. After the operation the paralysis of the eye muscles gradually disappeared.

In three cases of suppuration in the antrum of Highmore with orbital complications, the author mentions the value of the Caldwell-Luc operation. Three cases of chronic suppuration of the ethmoid and frontal sinuses with cerebral complications, are also given. In one case a diagnosis of acute suppuration of the frontal sinus was made. The operation showed an absence of the frontal sinus, and the dura was immediately exposed. An extradural abscess resulted, which got well. This experience shows how important it is to have a radiograph made before the operation.

In another case, in a man twenty-three years old, an osteomyelitis of the frontal bone in connection with a chronic suppuration of the frontal sinus and ethmoid cells, led to a meningitis and septicemia. The Kuhnt radical operation was performed in this case, but the patient did not recover.

In the last case, a girl, nineteen years old, there was present an ozena with a left sided empyema of the frontal sinus and ethmoid cells. During the Killian operation an abscess of the frontal sinus with an extradural abscess was discovered. After two months of apparently complete cure, cerebral symptoms again developed and an abscess of the frontal lobe at a depth of 5 cm. was found. The patient died of a meningitis caused by a breaking through of the abscess into the ventricle. *Theisen.*

Chronic Infections of the Ethmoid Cells and the Sphenoid, with Especial Reference to Their Relations to General Medicine and Their Diagnosis Through the Roentgen Rays.

RHESE (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reaches the following conclusions in a paper of sixty pages:

1. Chronic inflammations of the ethmoid labyrinth and of the sphenoid are capable of maintaining a continuance of other nasal affections. They constitute, further, the point of departure for diseases of other organs of the body, near and remote, and have therefore a great significance for general medicine.

2. The significance is essentially increased by the fact that chronic infections of the ethmoid and sphenoid are in themselves exceedingly common diseases, and furthermore, since they readily maintain an insidious and latent course.

3. Chronic infections of these cavities are of importance for the etiology and the maintenance of the following diseases:

(a) In the nose they may give rise to chronic maxillary and frontal sinus suppurations and general polyposis, as well as the clinical picture of atrophic rhinitis.

(b) They give rise to injuries of the nervous system, not only organically through causing cranial complications of nasal origin and with great frequency a chronic ethmoiditis or sphenoiditis is hidden behind the external picture of an apparent neurosis and neuralgia. (Hysteroneurasthenia, migraine, supraorbital neuralgia and other forms of headache and attacks of dizziness.)

(c) In affections of the ear they share the affections of the accessory sinuses. Tinnitus is frequently observed in suppuration of the ethmoid, and the sphenoid is not rarely the expression of an acoustic neuritis occasioned by absorption of toxins.

(d) With reference to the numerous relations which exist to affections of the eyes, it should be remarked that affections of the anterior ethmoid cells are especially apt to occasion disturbances of the lacrimal ducts. Furthermore, involvement of the optic nerve apparently arises as commonly through diseases of the posterior ethmoids as through that of the sphenoids.

(e) The air passages may be involved over the nasopharynx and bronchial tubes. The cases of chronic bronchitis occasioned by latent suppurations of the ethmoid and sphenoid are especially important, since they give rise to suspicion of tuberculosis.

(f) Chronic gastric and intestinal diseases may be origi-

nated or maintained by chronic inflammations of these cavities.

(g) Among the diseases of a general nature, chronic anemia together with chronic influenza may be caused by these suppurations, as well as metastatic involvement of other organs, often of directly cerebral complications.

4. The Roentgen diagnosis of diseases of the ethmoid and of the sphenoid is best accomplished by the sagittal position and the oblique position. In the interpretation of the plate and photographs especial importance attaches to the obliteration of the boundary lines.

5. The sagittal position is, in the first place, adapted to show to us the degree and the extent of an ethmoid infection. The information which it gives us is most definite and certain with reference to the posterior ethmoid labyrinth. The sagittal position is less reliable than the oblique position with reference to the anterior ethmoid, and particularly with reference to the frontals. The first has, according to experience, frequently failed to establish in cases where the oblique position showed pathologic alterations in the anterior ethmoid territory.

6. The diagnosis of the sphenoidal infection through the sagittal position rests upon the presence of a shadow in a territory denoted by the diagrams. (Then follow details which require examination of the excellent pictures in the original.)

7. Oblique positions have the following advantages: (a) They permit a good view of the whole anatomic relations. (b) They give more definite information than the sagittal pictures with reference to the pathologic alterations in the anterior ethmoid territory, especially in circumscribed diseases of this, for the reason that the territory in question comes upon the plate in a broader and more comprehensive expression.

(c) This advantage is particularly marked in diseases of the frontal cells which by oblique position become uncovered by the opposite side and therefore completely isolated upon the plate. Where we wish to be especially certain as to the condition of the frontal cells, and their relations to the frontal sinus, the oblique position is frequently indispensable, since many cases are known to occur in which the origin of the pus

and the clinical appearance is in favor of a frontal sinus suppuration, whereas actually the frontal sinus is poorly developed or entirely absent, and the suppuration actually arises from a large frontal cell.

8. For practical purposes in the majority of cases the sagittal position will be sufficient. If this is not adequate, the oblique position of both sides should be taken.

9. Chronic inflammation of the posterior ethmoid and of the sphenoidal sinus are found in about 66 2/3 per cent of all cases simultaneously. The value of the differential diagnosis between the diseases of these two regions is therefore diminished.

10. In many cases of latent disease the diagnosis may rest entirely upon the X-ray, as, for instance, when for the establishment of an ethmoidal or sphenoidal disease, the anatomic anomalies make extensive operation necessary for the establishment of the clinical diagnosis, and furthermore, when definite symptoms and complaints, such as, for instance, a sudden amaurosis, are found in harmony. This is particularly the case when dangerous complications, as orbital abscess, require an immediate clearing up of the situation and operation.

11. If the Roentgen rays show a definite obscuring while the clinical findings do not speak in favor of an ethmoidal or sphenoidal disease, further observations are necessary. As a matter of fact, many such cases consist of beginning alterations, which at the time are found neither on clinical examination nor by the complaint of the patient. *Goodale.*

III.—PHARYNX.

Retropharyngeal Struma.

TRAUTMANN (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reports a case of a man 43 years of age, who showed a growth on the posterior pharyngeal wall, which had remained unchanged for four years, and is considered by him to consist of dislocated and isolated thyroid tissue, without connection with the true thyroid. No operation was done, and the author advised care in the operative treatment of similar cases, lest this may be the only existing thyroid tissue in the body, and its removal may be followed by myxedema. *Goodale.*

IV.—LARYNX.

An Enlarged Demonstration Model of the Larynx.

KILLIAN (*Verhandlung des Verein Deutscher Laryngologen,* 1911, Curt Kabitzsch, Würzburg). It will interest teachers of medical students to know that Prof. Killian has had constructed a model of the larynx, enlarged nine times, the interior of which, by means of a mirror placed above it, can be demonstrated to students in all parts of a large lecture hall. The model is constructed by Herrn Vogelbacher, Freiburg, in Breisgau. *Horn.*

Laryngeal Paralyses in Diseases of the Medulla Oblongata and Semon's Law.

FREYSTADTL (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reports two cases of syringomyelia which exhibited all phases of vocal cord paralysis according to Semon's law. These paralyses are undoubtedly of medullary origin. Posticus paralysis is most often encountered, and it would appear that in symmetrical, diffuse diseases of the medullary nucleus of the medulla, the nucleus of the posticus is more vulnerable, and loses its function most readily. *Goodale.*

Aphthous Ulcerations of the Trachea and Larynx in Tuberculosis of the Lungs.

S. ZIBA (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reports a series of cases characterized by small ulcerations in the larynx or in the trachea, not showing bacilli of tuberculosis histologically, but on the other hand numerous Grampositive streptococci. The author considers these "aphthous" ulcerations to be occasioned by streptococci which are contained in the sputum, and infect the surface of the mucous membrane, giving rise to superficial necrosis of the tissues. It is probable that these "aphthous" ulcerations often become themselves infected by tubercle bacilli. *Goodale.*

Gymnastic Exercises of the Vocal Cords by Means of Electric Tuning Forks.

E. N. MALJUTIN (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) published in 1896 a method of exercising the vocal cords by placing the Bezold tuning fork on the chest

or the head of the patient, who was then made to speak in unison with the tuning fork. The vibrations of the fork were transferred to the vocal cords and the patient found involuntarily the right tone. If the tuning fork was placed on the head, it was easy to obtain a socalled head voice; if it rested on the chest, the resonating chest imparted the timbre of the chest tones to the voice. The author has devised an apparatus by which the sound of a tuning fork is transferred electrically to a given portion of the body. The author has found this method of service in persons who have lost their voice from acute catarrhal inflammations and overstrain.

Goodale.

Isolated Fractures of the Trachea.

M. ZIMMERMAN (*Archiv. fuer Laryngologie und Rhinologie*, Vol. 24, No. 3) reviews the literature, and considers the diagnosis as difficult to establish. In the larynx besides the subjective and objective manifestations of fracture, there may at times be found a deformity consisting of a flattening or widening of the Adam's apple, occasioned by the pressing in of the lateral plates of the thyroid cartilage, or an abnormal protrusion under the skin, in the form of irregular broken ends. At times one may also feel a slight depression at the point of fracture, or one may perceive an abnormal mobility of the individual cartilages of the larynx. Crepitation of the cartilage is rare, and is further to be considered with caution, since under normal conditions a form of crepitation may be elicited. An essential aid is the examination by the laryngeal mirror. At times lesions of the vocal cords may occur, or fragments of cartilage protruding into the lumen of the larynx, small hematomata, or swelling of the mucosa, which may extend the aryepiglottic folds, vocal bands and the covering of the arytenoids. The prognosis is usually good. If stenosis is present tracheotomy is necessary, but is to be avoided if possible.

Goodale.

Contribution to the Diagnosis of Rheumatic Paralysis of the Recurrent Nerve, and the Value of the X-Ray Examination.

LEVENSTEIN (*Archiv. fuer Laryngologie*, Vol. 25, Part 1). A few cases have been reported of recurrent paralysis of probable rheumatic origin. Others have been reported, dependent upon chemical poisons and also from various infectious diseases such as influenza, diphtheria and typhoid. In some

instances the recurrent paralysis may be complete, and if then gradually a typical posticus paralysis develops, tracheotomy may be necessary. The duration of the cases has ranged from 3 to 8 months, recovery being the rule. The author reports a case of a young man, previously in good health, who, after exposure to a draught, became suddenly hoarse, and showed on examination unilateral paralysis of the vocal cord, corresponding to the side of exposure. The treatment consisted partly in the use of the galvanic current applied both to the region of the right vagus and to the right vocal cord. After several months' treatment the motion in the cord returned, to a considerable extent, and the voice appeared somewhat better. The diagnosis of rheumatic paralysis would have been made, if later the X-ray examination had not been undertaken, This showed a spindle-shaped growth in the region of the subclavian artery, which was considered to be aneurysm of the subclavian.

Examination of the literature in the last twenty-five years shows that the greater number were reported previous to the discovery of the Roentgen rays, and in the great majority of the other cases no use was made of this method of diagnosis. The author consequently recommends great care in the making of a diagnosis of rheumatic paralysis. *Goodale.*

Two New Instruments for Bronchoscopic and Esophagoscopic Work.

KILLIAN (*Verhandlung des Verein Deutscher Laryngologen,* 1911, Curt Kabitzsch, Würzburg). For the purpose of conveniently examining the upper part of the esophagus and the hypopharynx, Prof. Killian has shown a long bivalve speculum which opens by hand pressure and fits into the regular Brunnings handle. He has also presented an instrument for measuring the diameters of the bronchial tubes on the living. This latter consists in a tiny pair of calipers on the end of the regular forceps handle which when opened in the bronchus registers the diameter at the handle. Both instruments are manufactured by F. L. Fischer, Freiburg. *Horn.*

The Combined Specific and Local Treatment of Laryngeal Tuberculosis.

EDMUND MEYER (*Verhandlung des Verein Deutscher Laryngologen,* 1911, A. Stuber's Verlag, Würzburg). At the

meeting of the German Laryngological Society, held recently in Dresden, Meyer gives his results in 23 cases of laryngeal tuberculosis in which he combined the tuberculin treatment with intralaryngeal cutting operations. He used as his injection an emulsion of the tubercle bacilli, known to the trade as "Bazillen-Emulsion Höchst" nach Dr. Fritz Meyer (S. B. E. Höchst). In all his operations he used the bloody method and removed as much as possible at one sitting. He does not recommend the use of the cautery. From X-rays he has seen no cases cured. The method of using the preparation was exactly the same as for cases of pulmonary tuberculosis, and he insists on the giving of very small doses and never getting a reaction which would raise the temperature over 37.5 C. In those cases which formerly had shown but little tendency to be influenced by the tuberculin treatment, under this combined method he observed such results as had never before been his pleasure to see. Most of his patients were ambulatory, and some of his cures were certainly remarkable. The cases are not carefully tabulated, so that the reviewer cannot quote statistics. The case histories are well worth study in the original. *Horn.*

V.—MISCELLANEOUS.

The Action of Salvarsan on Syphilis of the Upper Air Passages, Scleroma, on the Plaut-Vincent Angina, and on Scorbutus.

GERBER (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reports a series of cases of syphilis of the upper air passages, who had shown secondary tertiary lesions recurrent, in spite of repeated treatment with mercury and iodin. In all instances the specific lesions disappeared with great rapidity. The most obstinate one was a case of severe necrosis of the nose and upper jaw, in which a sequestrum required six weeks for exfoliation. Injections were made in the gluteus muscles in eight instances and in the veins in nine. The intravenous injection is least pleasant at the time, but soon becomes relatively more comfortable than those made into the muscles. Brief symptoms of poisoning occurred in some instances on the following day, but soon disappeared. Injections into the gluteus gave rise to infiltrations which were sensitive sometimes for two to three weeks.

The author tested salvarsan in one case of scleroma with negative result.

In the Plaut-Vincent angina, it yielded promptly, the discomfort disappearing on the next day, and the ulceration in three to four days. At the same time the spirochæte and fusiform bacilli disappeared. These results were in harmony with others already published by Ehrlich and by Rumpel. In one case there was an association of scorbutus characterized by ulcerative inflammation of the gums, mouth and tonsils, in which the inflammation disappeared on the second day.

These cases show that we have in salvarsan a specific remedy against spirochæte infections, in which syphilis naturally occupies the first place. *Goodale.*

The Correction of Facial Paralysis by Plastic Operations with the Muscles of the Face.

LEXNER, Jena (*Muench. med. Wochenschr.*, Vol. 58, No. 15), has succeeded in one case of complete facial paralysis in obtaining a very satisfactory cosmetic and functional result by transplanting the anterior edge of the masseter to the upper and lower angle of the mouth. In a similar way the anterior edge of the temporalis with its point was transplanted subcutaneously to the outer angle of the eye. The patient had a perfectly symmetrical position of the mouth even while laughing. *Horn.*

The Results of the Local Treatment of Chronic Inflammatory Diseases of the Bronchial Tubes.

EPHRAIM (*Deutsche medizinische Wochenschrift*, November 9, 1911). The former methods of treatment in chronic affections of the bronchial tubes fail in the majority of the cases. Inhalations of finely vaporized fluids are absolutely useless. Bronchoscopic examinations as well as animal experimentations show that even in the favorable cases the particles of the fluid used that reach the bronchial mucous membrane are so small in amount that the therapeutic action is practically nil.

The author has experimented on dogs and squirrels, by carrying an atomizer into the main bronchus and spraying in a coloring fluid and then immediately taking out the lungs, in order to prevent a diffusion of the fluid, and has found large

parts of the lung colored. Microscopic examination showed, that in these regions, not only the walls of even the smallest bronchi, but also the walls of the alveoli were colored.

The author's investigations in animals show, that through these endobronchial injections, the fluid can be carried into the smallest bronchi.

Technic in Patients.—The fluid to be used in cases of bronchial catarrh, may be injected through a bronchoscope, but the author uses a method which is much more agreeable to the patient than the introduction of the bronchoscope. After anesthetizing the glottis by a spray or application and the trachea by using a properly curved vaporizer, a canula attached to a flexible vaporizer can be carried directly into the right or left bronchus. In order to inject the medicated fluid over as far an area as possible, the instrument is slowly raised and lowered while the injection is being made.

Therapeutic Results.—The author has treated one hundred and sixty-one patients endobronchially, that before had been treated without result in the usual way. Twenty-two were suffering from a chronic or subchronic catarrhal bronchitis. In eighteen of these cases after a single endobronchial injection, the improvement was so decided that further treatment for the complete relief was unnecessary. The injected fluid which is finely vaporized, was usually 5-7 ccm. for each bronchus. The author usually used novocain 2.0, suprarenin solution (1-1000) 10.0, physiologic salt solution ad. 100.0. In cases with very profuse secretion the author has used with good results a 1/6 per cent silver nitrate solution. In two cases of long standing purulent bronchitis with a few injections of a 5-10 per cent turpentine emulsion to which was added some suprarenin, the author was able to completely check the secretion.

In a case of bronchiectasis, after fifteen injections, the patient has improved so greatly that for a year he has raised only from 5 to 7 ccm. of an odorless sputum daily, while before the treatment he had been raising from 120 to 150 ccm. of a very foul secretion.

In a second case, the author obtained the same good results, the amount of expectoration diminishing from 250 to 60 ccm. The treatment in both these cases consisted in the injection of turpentine and other oils, iodoform, and iodol emulsion, preceded by the use of hydrogen peroxid.

The majority of the author's observations were in cases of bronchial asthma. He has treated one hundred and thirty-three asthmatic patients, endobronchially. The following interesting observations were made: The endobronchial injection of suprarenin mixed with novocain, invariably relieved the asthmatic paroxysms in a few minutes; patient's breathing became easy and the wheezing and whistling disappears.

The method, as to whether the injection is made through a bronchoscope or with the curved spray apparatus, does not make any difference. The complete relief from the asthmatic attacks in the majority of the patients lasts a long time, that is, weeks, months or even over a year. In other cases, but much less frequent, the symptoms return after a shorter interval, but usually disappear again for a long time after one or more treatments.

Out of the one hundred and thirty-three asthmatics, there were thirteen in whom the asthmatic attacks only came on every few months and lasting only a few days. In this periodic form of asthma, the result of the treatment is not as good, but even in this form, out of ten patients who had been kept under observation, three remained entirely free from attacks. In six other cases of well marked neurasthenic asthma, in only two was a lasting result obtained.

The most favorable cases for treatment were the cases of true bronchial asthma, accompanied by chronic bronchitis and emphyema, with almost daily paroxysms. Of one hundred and three cases of this kind treated endobronchially, and in whom other methods of treatment had been absolutely of no avail, eighty-eight could be kept under observation. In seventy-two the result of the treatment was very satisfactory, and forty-eight of these did not have any recurrences.

Conclusions.—The author's experience with this method of treatment, shows without a doubt, that endobronchial injections furnish a method which is not only not harmful, but in many otherwise incurable cases, is of the greatest benefit.

The author states that the method must be more universally employed, before any positive conclusions can be drawn. It is a question as to whether diseases of the lung tissue itself cannot be treated in this way, because the author's experiments in animals shows that the injected fluid was carried even to the alveoli. *Theisen.*

BOOK REVIEWS.

Verhandlungen Vereins Deutscher Laryngologen, 1911.

Published by Curt Kabitzsch (A. Stuber's Verlag), Würzburg. Price, marks 7.0.

This year's meeting of the German Laryngological Society was one of the best attended and most important scientifically in the history of the society. In these pages many of the individual papers of the meeting have been and will be reviewed in detail, but every contribution this year is worthy of careful study. It is not fair to the rest of the excellent papers to select any for special notice, but certainly Prof. Rumpf's magnificent address on the present position of the tuberculosis question, and especially as it relates to the question of laryngeal tuberculosis, is well worthy of an especial translation in full.

Prof. Edmund Meyer gave a very interesting review of his work on the combined surgical and tuberculin treatment of laryngeal tuberculosis, an abstract of which appears in this number. Some very excellent original papers along the lines of experimental phonetics would interest specialists in this subject. Killian's very important article on bronchoscopy in small children, which will be reviewed in full, is well worthy of special study. Ritter of Berlin showed two of his cases in which he had operated the frontal sinus with retention of the anterior wall. This operation, which he proposed about two years ago, is the only operation of the kind which has proved practical. It is not in any sense a plastic, but by means of a small horizontal incision at the upper border of the previously determined form of the frontal sinus, the sinus is opened and curetted from above.

For those specialists who read German, a full set of these transactions should find a place in their libraries. Published immediately after the meeting, the papers are often unpublished elsewhere. The transactions, therefore, enable one to keep in touch with laryngologic progress in Germany.

Horn.

Handbuch der Speziellen Chirurgee des Ohres und Oberen Luftwege.

Edited by KATZ, PREYSING and BLUMENFELD. Published by Curt Kabitzsch (A. Stuber's Verlag), Würzburg. Price: Vol. III, Parts 1 and 2, marks 12. Vol. I, Second Half, Part 1, marks 6.

The first five parts of this monumental work have already been reviewed in these ANNALS. They dealt exclusively with the anatomic side of the subject. The two present volumes have taken up the beginning of the practical side. Since the publication of Heymann's Handbuch in the 80's, nothing has been attempted which gives such a complete reflection of the modern German school of specialists as the present work.

The first part of the second half of Volume I is a book of over one hundred pages and deals exclusively with the subject of stenoses of the upper air passages. Perhaps no one in Europe could have been more happily selected than Pieniazek of Krakau, who by the publication of his classical text book on this subject a few years ago, has become the acknowledged dean in this matter. Suffice it to say that the scattered literature on the subject has here been gathered together and carefully digested. The present work is the most complete of its kind in any language.

The bronchoscopic treatment of bronchial asthma has now evidently won for itself a place in our methods of treating this obstinate disease, and Pieniazek warmly recommends it, especially in the more obstinate cases. Sometimes he considers it necessary to repeat the treatment more than once.

The chapter on intubation, its indications and use, both for acute stenoses and for purposes of dilatation, is especially good. The subject of difficult decanulization is very thoroughly treated in great detail and many valuable suggestions are made.

The most interesting of all the set so far is the first and second parts of the third volume, a book of over 250 pages, and deals principally with the first part of Prof. Boenninghaus' article on the surgery of the accessory sinuses. To those who are acquainted with his text book of otology, much was expected in this article, and we have not been disappointed.

Practical and useful should be applied to every word in the

entire book. His chapter on the differential diagnosis of the sources of pus found in different regions of the nose is a masterpiece of brevity and clarity. Every modern operation on the accessory cavities is carefully described, and his well-known skill in drawing and semidiagrammatic figures is given full play.

The publishers have, as usual, spared no expense in typography or illustrations, and if the subsequent volumes maintain the present high standard, the work will easily rank as one of the great masterpieces in the literature of the surgery of the ear and upper air passages. *Horn.*

INDEX OF AUTHORS.

ABRAHAM, JOS. H., 912.
Adams, John L., 737.
Albrecht, 736.
Alderton, H. A., 240, 243, 246, 965, 971, 973.
Alexander, G., 441.
Allport, Frank, 232, 400, 727, 923, 935, 945.
Arrowsmith, H., 273.
Atwood, 492.

BABBIT, J. A., 702.
Bahri, 743.
Barany, Robert, 497.
Barnes, 789.
Beck, Jos. C., 667.
Berens, 471, 473, 474.
Blackwell, H. B., 450, 468, 486, 489, 701.
Botay, 744.
Broeckaert, 268.
Brown, H. B., 194, 211, 861.
Bruce, 253.
Bruhl, G., 983.
Bryant, W. Sohier, 94, 192, 194, 226, 271, 488, 493, 612, 733, 880, 933, 939.
Buchanan, R. M., 56.

CANTAS, 266.
Carroll, 807.
Carter, W. W., 491, 991.
Chamberlin, W. B., 715, 721.
Chambers, T. R., 486, 491, 683.
Chiari, 504.
Claus, 256.
Cocks, G. H., 490, 491.
Coffin, Lewis A., 482, 485, 718, 723.
Cole, 477.
Cornet, 251.
Cowen, Wm., 243.
Craig, Robt. H., 629.
Crockett, E. A., 921.
Culp, John F., 707.
Curtis, H. H., 728.

DANELON, 497.
Danziger, 696, 698.
Davis, Geo. E., 695, 699.
Day, Ewing W., 388, 394, 929.
Dench, E. B., 54, 129, 182, 185, 186, 187, 189, 191, 192, 193, 195, 205, 212, 213, 216, 240, 242, 248, 958, 959, 961, 965, 969, 970, 971, 972, 975, 977, 980.
Denker, 259.
de Ponthiere, 262.
Dixon, 207.
Dougherty, D. S., 434, 474, 475, 476.
Duel, A. B., 184, 189, 195, 203, 248, 936, 956, 958, 959, 962, 963, 964, 973, 978.
Dwyer, 197.

EAGLETON, W. P., 467, 473, 695, 698, 700.
Emerson, F. P., 41, 720.
Ephraim, 1005.
Escherich, 506.

FARRELL, T. H., 67.
Fein, 264.
Ferreri, G., 94.
Ferris, Hy. C., 493.
Fletcher, J. R., 144.
Forbes, Duncan, 272.
Fournier, 744.
Fowler, E. P., 63.
Fraser, J. S., 253, 992.
Freudenthal, 1, 709, 712, 726, 742.
Freystadtl, 1001.
Fridenberg, Percy 138, 182, 189, 784.

GALLAGHER, THOS. J., 728, 730.
Gerber, 1004.
Getchell, Albert C., 565.
Gleitsmann, J. W., 902.
Glogau, Otto, 428.
Goldstein, M. A., 948, 953.
Grayson, Chas. P., 915.
Gruening, E., 197, 238, 240, 248, 955, 956, 959, 961, 963, 965, 971, 975, 978.
Guntzer, 206, 470.
Gwathmey, J. T., 841, 918ñ 920.

HALLE, 500.
Harris, Thos. J., 237, 238, 256, 259, 260, 261, 262, 506, 711, 922, 941.
Haskin, W. H., 49, 196.
Hastings, Hill, 638.
Hays, Harold, 86, 196, 208, 234, 487, 491, 627, 633, 694, 695, 696, 698, 737, 835.
Held, R. Johnson, 655.
Heller, 186.
Hirsch, 738.
Hoag, David E., 471.
Holmes, E. M., 29, 511, 939, 942.
Hopkins, F. E., 470, 475, 575, 825.
Hubbard, Thos., 703, 730.
Hudson-Makuen, G., 710, 947, 953.
Huey, Arthur J., 82.
Hurd, Lee M., 488, 698, 851.
Hyslop, 981.

IMHOFER, 739.
Ingals, E. F., 707.
Ingersol, J. M., 562.

JACQUES, 881.
Jarecky, 187.
Jones, Ernest, 989.
Jordan, 481, 485.
Jouty, 260.
Johnson, W. B., 181, 188, 220, 473, 474.
Johnston, 709.

KELSEY, A. L., 463.
Kelly, A. Brown, 264.
Kenefick, Jos. A., 249, 481, 482, 695, 977, 979.
Kerrison, Philip D., 43, 184, 191, 193, 488, 494, 956, 957, 979.
Kiefer, Hugo A., 71.
Keiper, Geo. F., 706.
Killian, G., 255, 994, 1001, 1003.
Kolmer, J. A., 986.
Kopetzky, S. J., 251, 929, 945.

LAKE, R., 984.
Lederman, M. D., 480, 487, 493, 706.
Leland, Geo. A., 925.
Leshure, 485.
Leszynsky, W. M., 699.
Levenstein, 1002.
Lewis, R. L., 244, 974, 976, 977.
Lexner, 1005.
Libman, E., 199.
Lockard, L. B., 706.
Logan, J. F., 719.
Loughran, Robt. L., 134, 181.
Loewe, 500.
Lutz, S. H., 957, 970, 971, 978, 979.

MAC WINNIE, A. M., 256.
Maljutin, E. N., 1001.
McCoy, John, 479, 482, 484.
McCullagh, Samuel, 943, 947.
McKernon, J. F., 205, 216, 979.
McKimmie, O. A. M., 454.
Means, Chas. S., 720.
Meyer, Edmund, 1003.
Mulligan. Wm., 253.
Morian, 734.
Moure, 252, 941.
Myles, Robt. C., 471, 477, 478, 484, 664, 707, 712.
Myers, H. L., 460.

NITCHIE, EDWARD B., 74, 213, 217.
Noon, L., 990.

OPPENHEIMER, S., 109, 197, 209, 212, 218, 219, 221, 227, 231, 255.

PACKARD, F. R., 918.
Page, J. R., 735.
Perkins, Chas. E., 423, 432, 469, 470, 471, 474.
Pfannstell, S. A., 989.
Phillips, W. C., 193, 194, 913, 974, 977.
Porcher, W. P., 989.

RAE, JOHN B., 211, 228, 239, 242, 487, 498.
Randall, Alex, 426.
Reik, H. O., 731, 916.
Rethi, 501, 503.
Reynolds, F. E., 992.
Rhese, 997.
Richards, Geo. L., 578, 705, 711, 720, 933, 971.
Richards, J. D., 473, 475.
Richardson, C. W., 618.
Rosenberg, Max, 740, 992.

SENATOR, 271.
Schaeffer, Jacob Parsons, 277.
Schamberg, M. I., 492, 494.
Scheppegrell, 258.
Schiffers, 259.
Schroetter, 504.
Schwerdtferger, 739.
Sheppard, J. E., 247, 250, 960, 961, 964, 965, 969, 970, 979.
Shurley, B. R., 711, 953.
Skillern, R. H., 729,
Smith, S. MacCuen, 601, 715, 725, 728, 911.
Smyth, H. E., 185, 367.
Snow, 981.
Sondern, F. E., 621.
Stacke, 893.
Steinschneider, 496.
Stephenski, 272.
Streit, H., 994.
Stucky, J. A., 718, 917, 919, 921, 932.
Struycken, 496, 733.
Swain, H. L., 545, 716.

TENZER, 262.
Theisen, C. F., 595.
Turner, Logan, 751.
Trautmann, 1000.

UFFENORDE, W., 996.
Urbantschitch, 985.

VOISLAWSKY, A. P., 186.

WAGNER, H. L., 827.
Wells, W. A., 713, 721, 730, 932.
Welty, C. F., 167.
Weston, W. G., 986.
White, J. Vernon, 262, 717, 918.
Whiting, F., 199.
Williams, P. W., 271.
Wilson, N. L., 470, 707, 727, 944.
Winslow, J. R., 705.
Wishart, D. J. G., 715, 730.
Wood, Geo. B., 531.
Wright, J. D., 213, 950.

YANKAUER, S., 229, 414, 418, 421, 470, 937, 941, 943.
Yearsley, M., 735.

ZIBA, S., 1001.
Zimmerman, M., 1002.

INDEX OF TITLES.

ABORTION, advisability of performance in progressive deafness, Gruening, 971.
Abscess, brain, from gunshot wound of mastoid, Oppenheimer, 219.
Abscess, brain, subdural drainage, Day, 394.
Abscess, cerebellar, suggestive of labyrinthine suppuration, Kerrison, 43, 191.
Abscess, cerebellar, with lateral sinus thrombosis, Dougherty, 434, 474.
Abscess, mastoid, mistaken for typhoid or malarial fever, Cowen, 243.
Abscess, middle ear, followed by encephalitis, Alderton, 240.
Abscess, perisinus, with sinus thrombosis from scarlet fever, followed by late mastoiditis, Alderton, 246.
Abscess, peritonsillar, followed by fatal hemorrhage, Coffin, 482.
Abscess, temporosphenoidal, complicating chronic purulent otitis media, Lewis, 244.
Abstracts from current literature, 251, 496, 733, 981.
Acustic neuritis alcoholic, Morian, 734.
Adenoid, recurrences after operations, Imhofer, 739.
Adenoidectomy failures, White, 262.
Air conduction, upper tone limit, Struycken, 496, 733.
Alveolar sarcoma, Alderton, 971.
American Laryngological, Rhinological and Otological Society, 702, 911.
Analgesic, cycloform, Rosenberg, 740.
Anesthesia in operations upon the upper respiratory tract, Gwathmey, 841, 918.
Anesthesia, local, of drum membrane, Albrecht, 736.
Angina, Ludwig's, Delie, 503.
Angina, Plaut-Vincent, action of salvarsan, Gerber, 1004.
Antistreptococcic serum in treatment of meningitis, Dench, 970.
Aphonia, hysterical, treatment of, Senator, 271.
Aphthous ulcerations of trachea and larynx in tuberculosis of lungs, Ziba, 1001.
Articulatory capacity in children, relation to nasal obstruction, Jones, 989.
Asthma, bronchial, Schroetter, 504.
Asthma, endoscopic treatment, Freudenthal, 709, 742.
Attic suppuration cured by autogenous vaccine, Cocks, 490.
Auditory canal, external, carcinoma, Kiefer, 71.
Auditory nerve trunk, division for persistent tinnitus, Dench, 965.
Aural, acute disease with intracranial lesions, Smith, 601.
Aural affections and dental lesions, Kenefick, 977.
Aural disease, followed by intracranial complications, operative treatment, Eagleton, 698.
Aural massage, methods, Randall, 536.
Aural suppuration, with irregular symptoms, Dench, 129.
Aural tuberculosis, Milligan, 253.
Aural tuberculosis in children, Milligan, 253.
Aural vertigo, operation, Lake, 984.
Auricle, supernumerary, associated with chronic suppurative otitis media, Hays, 627.
Autointoxication, active, in relation to middle ear and mastoid inflammations, Snow, 981.

BACTERIA, pathogenic in blood, Sheppard, 247.
Blood cultures in otitic disease and sinus thrombosis, Oppenheimer, 109, 197.
Blood cultures in otology, Sondern, 621.
Bloodclot surgery of the mastoid region, Blackwell, 450, 486.
Blood serum, blood injections for hemorrhage, spontaneous or postoperative, Theisen, 595.
Bone conduction, upper tone limit, Struycken, 496, 733.
Bone transplantation for depressed deformity of the nose, Carter, 991.
Book reviews, 275, 509, 746, 1008.
Brain abscess, subdural drainage, Day, 394.
Brain abscess, with gunshot wound of mastoid, Oppenheimer, 219.
Bronchi, smaller, multiple foreign bodies, Hopkins, 825.
Bronchial tubes, inflammatory diseases under local treatment, Ephraim, 1005.
Bronchoscopic instruments, Killian, 1003.
Bronchoscopy, fatal case, Chiari, 504.
Bronchoscopy for foreign bodies, with remarks concerning bronchial asthma, Schroetter, 504.

Bronchoscopy for foreign body in bronchus, Yankauer, 418.
Bronchoscopy for tumor in the lower trachea, Yankauer, 418.
Bronchus, foreign body, removal by upper branchoscopy, Yankauer, 418.

CARCINOMA, external auditory canal, Kiefer, 71.
Circinoma pinna, Kiefer, 71.
Cartilaginous tumors of the larynx, Carroll, 807.
Cavum nasi, lateral wall in man, with especial reference to the various developmental stages, Schaeffer, 277.
Cerebellar abscess suggestive of labyrinthine suppuration, Kerrison, 43, 191.
Cerebellar abscess with thrombosis of lateral sinus, operation, recovery, Dougherty, 434, 474.
Cerebellum, relation to vestibular apparatus, Barany, 497.
Cerebral symptoms following mastoiditis relieved by decompression, Perkins, 432, 471, 473.
Chondroma of nose, Schwerdtferger, 739.
Chorea, nasopharyngeal origin, de Fonthiere, 262.
Cholesteatoma of ear, relation of otitic meningitis, Danelon, 497.
Collapse induration of right pulmonary apex and chronic nasal stenosis, Rosenberg, 993.
Coryza, acute, followed by deafness, Lewis, 974.
Cycloform, a new analgesic, Rosenberg, 740.

DEAF child, medicoeducational problem, Hudson-Makuen, 947.
Deaf ear substituted by the eye, Nitchie, 74.
Deafness following acute coryza, Lewis, 974.
Deafness, progressive, suggesting advisability of performing abortion, Gruening, 971.
Decompression in mastoiditis, followed by cerebral symptoms, Perkins, 432, 471.
Deformities, nose depressed, corrected by transplantation of bone, Carter 991.
Dental lesions as etiologic factors in otolgia and tinnitus, Schamberg, 492.
Dental lesions, relation to aural affections, Kenefick, 977.
Diphtheria bacillus, latent infections, Williams, 271.
Diphtheria contacts, measures required, Forbes, 272.
Diphtheria infection, latent and method of dealing with contacts, Buchanan, 506.
Diphtheria of the upper respiratory organs, passive immunization, Wagner, 827.
Drum membrane, local anesthesia, Albrecht, 736.

EAR and social hygiene, Fridenberg, 784.
Ear bleeding, recurrent, Sheppard, 964.
Ear, internal, necrosis of, McCoy, 479.
Ear, pathologic conditions, resulting in profound impairment of hearing, Dench, 54, 213.
Ear tests, Fowler, 63.
Ehrlich-Hata treatment, results in Vienna, Escherich, 506.
Empyema of antrum of Highmore, treatment by means of a temporary resection of inferior turbinate, Hirsch, 738.
Encephalitis following abscess of middle ear, Alderton, 240.
Endobronchial treatment of asthma, Freudenthal, 742.
Endocarditis, relation of enlarged tonsils, Getchell, 665.
Endoscopic treatment of asthma, Freudenthal, 709.
Epilepsy complicating mastoiditis, Brown, 211.
Epistaxis, prolonged, associated with increased vascular tension, Hays, 737.
Esophagus, foreign body removed by the modified Kirmissom hook, Botay, 744.
Esophagus, foreign body removed with aid of esophagoscope, Yankauer, 414.
Esophagus in which maltese cross was fixed, failure of esophagoscope; extraction with Kirmissom hook, Fournier, 744.
Esophagus, removal of coins, Myers, 460.
Esophagoscope as an aid in removing foreign bodies from esophagus, Yankauer, 414.
Esophagoscope, failure in extracting maltese cross fixed in esophagus, Fournier, 744.
Esophagoscopic instrument, Killian, 1003.
Ethmoid infection, relation to general medicine and diagnosis by Roentgen rays, Rhese, 997.
Ethmoidal neurosis, Killian, 255.
Ethmoid, operation benefiting optic neuritis, Smith, 721.
Eustachian tube, closure by Yankauer method, McCullagh, 943.
Eustachian tube, examination and treatment with nasopharyngoscope, Holmes, 29, 511, 939.
Eustachian tube, pharyngeal orifice, with demonstration of speculum and other instruments for direct examination and treatment, Yankauer, 937.

Eustachian tube, recent advances in treatment, Yankauer, 937.
Eustachian tube, speculum for examination and treatment of, Yankauer, 421, 470.
Eye, educated as a substitute for deaf ears, Nitchie, 74, 213.

FACIAL paralysis corrected by plastic operations on muscles of face, Lexner, 1005.
Facial paralysis with Meniere's symptom, Bruce and Fraser, 253.
Fistula, nasal, Streit, 994.
Fibrolysin in fibrosis of the middue ear, Yearsley, 982.
Fibrolysin in otology, Yearsley, 735.
Fibroma of nasopharynx, Chamberlin, 683, 715.
Fibroma, rhinopharyngeal, insertion and seat of, Jacques, 881.
Fibromata, retropharyngeal, insertion and seat of, Jacques, 881.
Fibrosis middle ear treated by fibrolysin, Yearsley, 982.
Foreign bodies, multiple, in smaller bronchi, Hopkins, 825.
Fracture trachea, isolated, Zimmerman, 1002.
Frontal sinus, radical operation, preservation of anterior wall, Gallagher, 728.
Furuncle of the canal simulating otitis media purulenta acuta; mastoiditis, perisinus abscess with perforation of the premastoid lamina, Blackwell, 468.

GENERAL medicine, relation of ethmoid and sphenoid infection, Rhese, 997.
Gymnastic exercises of vocal cords by means of electric tuning forks, Maljutin, 1001.

HAY fever, immunization treatment of, Scheppegrell, 258.
Hay fever, prophylactic inoculation, Noon, 990.
Hearing, mechanical aids, Fridenberg, 138, 182.
Hearing, upper limit, determination, Struycken, 496.
Hemorrhage, ear, Sheppard, 964.
Hemorrhage from peritonsillar abscess, Coffin, 482.
Hemorrhage into labryinth, Phillips, 974.
Hemorrhage, late secondary, after tonsillotomy, Hopkins, 675.
Hygiene ear and social, Fridenberg, 784.
Hypophysis, operation, Fein, 254.
Hysterical aphonia, treatment, Senator, 271.

IMPAIRED hearing, profound, from pathologic conditions of ears, Dench, 54, 213.
Infections, bacterial, spread of, from nasal and nasopharyngeal cavities by way of lymphatic channels, Turner, 751.
Internal ear necrosis, McCoy, 479.
Intracranial complications of aural disease, Eagleton, 698.
Intracranial lesions with acute aural disease, Smith, 601.
Intracranial murmurs in relation to tinnitus aurium, Hyslop, 981.

JUGULAR bulb, intervention, Moure, 252.

KIPP, obituary, 467, 955.
Kirmissom hook, modified, for removal of sou from esophagus, Botay, 744.

LABYRINTH drainage with hearing existing after two years, Dench, 959.
Labyrinth, effect of Ehrlich-Hata remedy, Alexander, 441.
Labyrinth, hemorrhage, 974.
Labyrinthine fistula, Kerrison, 956.
Labyrinthitis, Urbantschitch, 985.
Labyrinthitis, acute suppurative, in conjunction with acute otitis media suppurativa, Duel, 962.
Labyrinthine suppuration suggesting cerebellar abscess, Kerrison, 43, 191.
Lactic acid bacilli in treatment of otitis media suppurativa, Haskin, 49, 196.
Lactic acid ferment in ozena and otorrhea, Stephenski, 272.
Lamp, vest pocket head, Hays, 694.
Laryngitis, ulceromembranous, Moure, 741.
Laryngology, ideal clinic, Huey, 82.
Laryngoscopy, direct, Ingals, 707.
Laryngotracheal tract, stenosis treated with radium, Cantas, 266.
Larynx, aphthous ulcerations in pulmonary tuberculosis, Ziba, 1001.
Larynx, cartilaginous tumors, Carroll, 807.
Larynx, enlarged demonstration, Killian, 1001.
Larynx, extirpation, Craig, 629.
Larynx, paralysis in diseases of medulla and Semon's law, Freystadtl, 1001.
Larynx, tuberculosis, Meyer, 1003.
Larynx, tuberculosis, treatment with trichloracetic acid, Sytschow, 504.

Larynx tumors, cartilaginous, Carroll, 807.
Lateral sinus, superficial, in mastoiditis, Hopkins, 475.
Lateral sinus thrombosis with cerebellar abscess, Dougherty, 434, 474.
Lip reading, practical value, Goldstein, 948.
Ludwig's angina, Delie, 503.
Lupus, nose, Pfannstell, 989.
Lymphatic channel, spread of bacterial infections from nasal and nasopharyngeal cavities, Turner, 751.

MALARIAL fever or typhoid mistaken for mastoid abscess, Cowen, 243.
Malleus lying free in the tympanic cavity, Lewis, 976.
Mastoid abscess mistaken for typhoid or malarial fever, Cowen, 243.
Mastoid, gunshot wound, Oppenheimer, 218, 219.
Mastoid inflammations, relations to active autointoxication, Snow, 981.
Mastoid operation for persistent pain in mastoid region, Harris, 237.
Mastoid operations, socalled conservative, with description of technic of Heath, Bondy and Siebenmann, Richards, 933.
Mastoid operation, technic of Heath, Bondy and Siebenmann, Richards, 578.
Mastoid pain, Lutz, 957.
Mastoid, radical operation, Allport, 400.
Mastoid, radical operation with Thiersch grafts, Welty, 167.
Mastoid radiographs, Myles, 477.
Mastoid, rarefying osteitis, Richardson, 618.
Mastoid region, bloodclot surgery, Blackwell, 450, 486.
Mastoid region, persistent pain treated by mastoid operation, Harris, 237.
Mastoid sarcoma, spindlecelled, Glogau, 428.
Mastoid wound, treatment following operation, Brown, 861.
Mastoiditis, atypical, Crockett, 921.
Mastoiditis complicated by epilepsy, Brown, 211.
Mastoiditis followed by cerebral symptoms, Perkins, 432, 471 473.
Mastoiditis, late, following scarlet fever with perisinus abscess and sinus thrombosis, Alderton, 246.
Mastoiditis, perisinus abscess, otitis media, simulated by furuncle of the canal, Blackwell, 468.
Mastoiditis treatment in infants Page, 735.
Mastoiditis with an unusually superficial sinus, Hopkins, 475.
Mastoiditis without apparent involvement of middle ear, Perkins, 423.
Maxillary sinus empyema, treatment by means of a temporary resection of the inferior turbinate, Hirsch, 738.
Maxillary sinus, probing followed by complications and death, Claus, 256.
Maxillary sinusitis, chronic, radical operation, Denker, 259.
Medulla, diseases causing laryngeal paralysis and Semon's law, Freystadtl, 1001.
Meniere's symptoms, with facial paralysis, Bruce and Fraser, 253.
Meningitis, otitic, presenting unique symptoms, Oppenheimer, 221.
Meningitis, otitic, relation to cholesteatoma of ear, Danelon, 497.
Meningitis, purulent, treated with urotropin, McKernon, 979.
Meningitis treated with antistreptococcus serum, Dench, 970.
Mental derangement associated with suppurative otitis media, Day, 388.
Middle ear abscess, followed by encephalitis, Alderton, 240.
Middle ear, conservative radical operation, Stacke, 893.
Middle ear fibrosis treated by fibrolysin, Yearsley, 982.
Middle ear inflammations, relation to active autointoxication, Snow, 981.
Middle ear suppuration, acute and chronic, treatment with autogenous vaccine in, Kopetzky, 251.
Middle ear suppuration treated with Yankauer operation, Hays, 86, 226.
Mucocele of nasal accessory sinuses, Hastings, 638.

NASAL and nasopharyngeal, spread of bacterial infections from, by way of lymphatic channels, Turner, 751.
Nasal fistula, median, Streit, 994.
Nasal obstruction, relation to articulatory capacity in children, Jones, 989.
Nasal or oral route for septum operations, Halle, 500.
Nasal septum, perforating ulcer, pathogenesis, Schiffers, 259.
Nasal sinuses, different methods of treatment, Hurd, 851.

Nasal sinuses, methods of treatment, Hurd, 851.
Nasal stenosis, chronic, and collapse induration of right pulmonary apex, Rosenberg, 993.
Nasopharyngeal origin of chorea, de Ponthiere, 262.
Nasopharyngoscope, Holmes, 29.
Nasopharyngoscope as aid in examination and treatment of eustachian tube, Holmes, 511, 939.
Nasopharyngoscope, electric, Emerson, 41.
Nasopharynx, examination and treatment with nasopharyngoscope, Holmes, 29.
Nasopharynx, fibroid polyps, Wells, 713.
Nasopharynx, fibroma, Chamberlin, 683, 715.
Nasopharynx, sarcoma, Farrell, 67.
Necrosis internal ear, existing but not evident at time of radical operation, McCoy, 479.
Neuritis acustica alcoholica, Morian, 734.
Neurosis, ethmoidal, Killian, 255.
New York Academy of Medicine, Section on Otology, 181, 191, 211, 218, 467, 477, 486, 694.
New York Otological Society, 237, 955, 962, 974.
Nose, chondroma, Schwerdtferger, 739.
Nose diseases, indication for radical operative procedure, Loewe, 500.
Nose lupus, Pfannenstell, 989.
Nose, primary tuberculosis of, Oppenheimer, 255.
Nose, sarcoma, Farrell, 67.
Nose, scab formation, Porcher, 989.
Nystagmus, vestibular, Fletcher, 144.

OPTIC neuritis benefited by operation on sphenoid and posterior ethmoid, Smith, 721.
Oral or nasal route for septum operations, Halle, 500.
Ossiculectomy, indications in chronic suppurative otitis, McKimmie, 454.
Osteofibroma occupying the tonsillar fossa, Kelsey, 463.
Osteitis, rarefying, of mastoid bone, Richardson, 618.
Otolgia due to dental lesions, Schamberg, 492.
Otitic disease, value of blood cultures, Oppenheimer, 109, 197.
Otitic meningitis presenting some unique symptoms, Oppenheimer, 221.
Otitic meningitis, relation to cholesteatoma of ear, Danelon, 497.
Otitis media suppurativa, associated with mental derangement, Day, 388.
Otitis media suppurativa, treatment in infants, Page, 735.
Otitis media suppurativa treated with suspensions of lactic acid bacilli, Haskin, 49, 196.
Otitis media suppurativa acuta in conjunction with acute suppurative labyrinthitis, Duel, 962.
Otitis media suppurativa acuta, mastoiditis, perisinus abscess with perforation of premastoid lamina, simulating furuncle of the canal, Blackwell, 468.
Otitis media suppurativa acuta, six cases in one family, Hays, 633, 695.
Otitis media suppurativa chronica associated with supernumerary auricle, Hays, 627.
Otitis media suppurativa chronica complicated by temporosphenoidal abscess, Lewis, 244.
Otitis media suppurativa chronica in which ossiculectomy is indicated, McKimmie, 454.
Otitis media suppurativa chronica showing results of the Yankauer operation, Hays, 225.
Otitis media suppurativa treated with bacterial vaccines, Weston and Kolmer, 986.
Otitis media treated by vaccine therapy, McDonald, 982.
Otolaryngology, teaching of, in undergraduate and postgraduate medical schools, Smith, 911.
Otology, blood cultures in, Sondern, 621.
Otorrhea, treatment with lactic acid ferment, Stephenski, 272.
Otosclerosis, Bruhl, 983.
Otosclerosis, etiology, Cornet, 251; Bryant, 612.
Otosclerosis, pathogenesis and treatment, Ferreri, 94.
Otosclerosis, treatment, Bryant, 733.
Ozena, Fraser and Reynolds, 992.
Ozena, pathogenic theories of, Jouty, 260.
Ozena, treatment with lactic acid ferment, Stephenski, 272.

PALATE, insufficiency congenital, Kelly, 264.
Paralysis, facial, corrected by plastic operations on muscles of face, Lexner, 1005.
Paralysis, facial, with Meniere's symptoms, Bruce and Fraser, 253.
Paralysis, larynx, in diseases of medulla and Semon's law, Freystadtl, 1001.
Paralysis, recurrent, laryngeal nerve, Broeckaert, 268.
Paralysis, recurrent rheumatic, Levenstein, 1002.

Perisinus abscess with sinus thrombosis from scarlet fever followed by late mastoiditis, Alderton, 246.
Peritonsillar abscess, followed by fatal hemorrhage, Coffin, 482.
Pinna, carcinoma, Kiefer, 71.
Plastic operation, Rae, 239.
Plaut-Vincent angina, action of salvarsan, Gerber, 1004.
Pneumococcus infections of the throat, Hays, 836.
Poliomyelitis, epidemic, Bryant, 271.
Polyps, fibrous, of nasopharynx, Wells, 713.
Pulmonary apex, right, collapse induration and chronic nasal stenosis, Rosenberg, 992.

RADICAL nose operations, indications, Loewe, 500.
Radiographs, stereoscopic, of the mastoid, showing the third dimension, Myles, 477.
Radium in disease of upper air tract, Freudenthal, 1.
Radium therapy in cicatricial stenosis in laryngotracheal tract, Cantas, 266.
Recurrent laryngeal nerve paralysis, Broeckaert, 268.
Recurrent laryngeal nerve paralysis, rheumatic, Levenstein, 1002.
Retropharynx struma, Trautmann, 1000.
Rheumatic paralysis of recurrent, value of X-ray examination, Levenstein, 1002.
Rhinolaryngology and relation to medicine, Arrowsmith, 273.
Rhinopharyngeal fibromata, insertion and seat of, Jacques, 881.
Roentgen ray diagnosis in sphenoid and ethmoid infections, Rhese, 997.
Roentgen ray examination in rheumatic paralysis of recurrent, Levenstein, 1002.

SALIVARY apparatus, diseases, treatment, Beck, 667, 702.
Salivary ducts and glands, symptoms and diagnosis of diseases of, Myles, 664, 702.
Salivary glands, anatomy and physiology, Held, 655, 702.
Salivary glands, diseases of, symposium, 911.
Salvarsan in syphilis of upper air passages, sarcoma, Plaut-Vincent angina and scorbutus, Gerber, 1004.
Sanatoria, tuberculosis, Gleitsmann, 902.
Sarcoma, alveolar, Alderton, 971.
Sarcoma, mastoid, spindlecelled, Glogau, 428.
Sarcoma, nasopharynx, Farrell, 67.
Sarcoma, nose, Farrell, 67.
Scab formation in nose, Porcher, 989.
Scarlatina and accessory sinus suppuration, Hubbard, 730.
Scarlet fever with perisinus abscess and sinus thrombosis followed by mastoiditis, Alderton, 246.
Scleroma, action of salvarsan, Gerber, 1004.
Scorbutus, action of salvarsan, Gerber, 1004.
Semon's law in laryngeal paralysis from diseases of the medulla, Freystadtl, 1001.
Septum, nasal, ulcer perforating, pathogenesis of, Schiffers, 259.
Septum operations in children, Rethi, 501.
Septum operations, oral or nasal route, Halle, 500.
Sinus and turbinal function, Adams, 737.
Sinus disease, complicated, Uffenorde, 996.
Sinus disease visual fields, MacWinnie, 256.
Sinus, frontal, radical operation, preservation of anterior wall, Gallagher, 728.
Sinus inflammations, treatment, Killian, 994.
Sinus, maxillary empyema treated by temporary resection of inferior turbinate, Hirsch, 738.
Sinus, maxillary probing followed by complications and death, Claus, 256.
Sinus, nasal, different methods of treatment, Hurd, 851.
Sinuses, nasal, mucocele of, Hastings, 638.
Sinus suppuration in scarlatina, Hubbard, 730.
Sinusitis, maxillary, chronic radical operation, Denker, 259.
Sinus thrombosis, Rae, 211.
Sinus thrombosis, diagnostic value of blood cultures in otitic disease, Oppenheimer, 109, 197.
Sinus thrombosis from scarlet fever followed by late mastoiditis, Alderton, 246.
Sinus thrombosis with extensive accumulation of fluid pus in the sinus, Loughran, 134, 181.
Society proceedings, 181, 250, 467, 694, 911.
Speculum for direct examination and treatment of eustachian tube, Yankauer, 421, 470.
Sphenoid infection, relation to general medicine and diagnosis by Roentgen ray, Rhese, 997.
Sphenoid, operation benefiting optic neuritis, Smith, 721.

Stenosis, cicatrical, in laryngotracheal tract, radium therapy, Cantas, 266.
Stenosis, nasal, chronic, and collapse induration of right pulmonary apex, Rosenberg, 992.
Streptococcus capsulatus in the blood, Sheppard, 960.
Struma retropharynx, Trautmann, 1000.
Syphilis treated with Ehrlich-Hata remedy and effect of latter on auditory labyrinth, Alexander, 441.
Syphilis upper air passages, action of salvarsan, Gerber, 1004.

TEMPOROSPHENOIDAL abscess complicating chronic purulent otitis media with septic temperature range as the only symptom, Lewis, 244.
Thiersch graft following radical mastoid, Welty, 167.
Throat, pneumococcus infections, Hays, 835.
Thrombosis lateral sinus with cerebellar abscess, Dougherty, 434, 474.
Thrombosis, sinus, Rae, 211.
Thrombosis, sinus, diagnostic value of blood cultures in otitic disease, Oppenheimer, 109, 197.
Thrombosis, sinus, with extensive accumulation of fluid pus in sinus, Loughran, 134, 181.
Thrombosis, sinus, from scarlet fever followed by late mastoiditis, Alderton, 246.
Thyroid, accessory tumors of the tongue, Smyth, 367.
Thyroiditis, acute suppurative, following grippe, Bahri, 743.
Tinnitus aurium in relation to intracranial murmurs, Hyslop, 981.
Tinnitus due to dental lesions, Schamberg, 492.
Tinnitus, persistent, treated by means of division of the auditory nerve trunk, Dench, 965.
Tone limit, upper, observations for air and bone conduction, Struycken, 733.
Tongue, accessory thyroid tumors of, Smyth, 367.
Tonsil fossa occupied by osteofibroma, Kelsey, 463.
Tonsil infection, relation of age, Barnes, 789.
Tonsil, radical operation, Tenzer, 262.
Tonsils, are they a menace or protection? Swain, 545.
Tonsils, enlarged, relation to endocarditis, Getchell, 565.
Tonsillectomy, Rethi, 503.
Tonsillectomy, technic, Ingersoll, 562.
Tonsillotomy followed by late secondary hemorrhage, Hopkins, 575.
Trachea, aphthous ulcerations in pulmonary tuberculosis, Ziba, 1001.
Trachea fractures isolated, Zimmerman, 1002.
Trachea, tumor, removal by upper bronchoscopy, Yankauer, 418.
Trichloracetic acid in tuberculosis of larynx, Sytschow, 504.
Tuberculosis, aural, in children, Milligan, 253.
Tuberculosis larynx, treatment with trichloracetic acid, Sytschow, 504.
Tuberculosis, nasal, primary, Oppenheimer, 255.
Tuberculous lesions treated by actual cautery, Wood, 531.
Tuberculosis larynx, Meyer, 1003.
Tuberculosis, pulmonary, and aphthous ulcerations of larynx and trachea, Ziba, 1001.
Tuberculosis sanatoria in the United States of America and Canada, summary of annual reports, Gleitsmann, 902.
Tumors, cartilaginous, of the larynx, Carroll, 807.
Tuning forks, electric, for gymnastic exercises of vocal cords, Maljutin, 1001.
Turbinal and sinus function, Adams, 737.
Tympanic membrane permeability, Steinschneider, 496.
Typhoid or malarial fever mistaken for mastoid abscess, Cowen, 243.

ULCER septum nasi, perforating Schiffers, 259.
Upper air tract, anesthesia, Gwathmey, 841, 918.
Upper air tract, circulatory reflexes, Bryant, 830.
Upper air tract, diphtheria, passive immunization, Wagner, 827.
Upper air tract, diseases treated with radium, Freudenthal, 1.
Upper air tract, neuroses, Bryant, 830.
Upper air tract, respiratory reflexes, Bryant, 830.
Upper air tract, syphilis, action of salvarsan, Gerber, 1004.
Urotropin in treatment of purulent meningitis, McKernon, 979.

VACCINE, autogenous, as a cure for chronic attic suppuration, Cocks, 490.
Vaccine therapy in acute and chronic middle ear suppuration, using autogenous, Kopetzky, 251.
Vaccine therapy in otitis media, McDonald, 982.

Vaccine therapy in otitis media suppurativa, Weston and Kollmer, 986.
Vascular tension, increased, associated with prolonged epistaxis, Hays, 737.
Vertigo, aural, operation, Lake, 984.
Vestibular apparatus, relation to cerebellum, Barany, 497.
Vibrators, electric suction massage, Phillips, 192.
Visual field in accessory sinus disease, MacWinnie, 256.
Vocal cords, gymnastic exercises by means of electric tuning forks, Maljutin, 1001.

YANKAUER method of eustachian tube closure, McCullagh, 943.
Yankauer operation in treatment of chronic middle ear suppuration, Hays, 86, 225, 226.

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CONTENTS

I.—The Therapeutic Value of Radium in the Treatment of Diseases of the Upper Air Tract. By Wolff Freudenthal, M. D., New York 1

II.—The Examination and Treatment of the Nasopharynx and Eustachian Tube by Aid of the Nasopharyngoscope. By E. M. Holmes, M. D., Boston 29

III.—The Electric Nasopharyngoscope. By Francis P. Emerson, M. D., Boston 41

IV.—History of a Case of Cerebellar Abscess Presenting Certain Features Suggestive of Labyrinthine Suppuration; Differential Points; Operation; Recovery. By Philip D. Kerrison, M. D., New York 43

V.—A Report of a Few Cases of Otitis Media Suppurativa Treated With Suspensions of Lactic Acid Bacilli. By W. H. Haskin, M. D., New York 49

VI.—A Consideration of the Pathologic Conditions of the Ear Resulting in Profound Impairment of Hearing. By Edward Bradford Dench, M. D., New York 54

VII.—A New Method of Eliciting the Functional Ear Tests—Preliminary Report. By Edmund Prince Fowler, M. D., New York 63

VIII.—Sarcoma of the Nose and Nasopharynx. By T. H. Farrell, M. D., Utica, New York 67

IX.—A Case of Carcinoma of the Pinna and External Auditory Canal. By Hugo A. Kiefer, M. D., Los Angeles 71

X.—Educating the Eye to Substitute for Deaf Ears. By Edward B. Nitchie, New York 74

XI.—The Ideal Clinic in Laryngology. By Arthur J. Huey, M. D., New York 82

XII.—The Yankauer Operation in the Treatment of Chronic Middle Ear Suppurations. By Harold Hays, A. M., M. D., New York 86

XIII.—The Pathogenesis of Otosclerosis—Treatment. By Professor Gherardo Ferreri, Rome, Italy. Translated by W. Sohier Bryant, A. M., M. D., New York 94

XIV.—Some Remarks on Sinus Thrombosis With Particular Reference to the Diagnostic Value of Blood Cultures in Otitic Disease. By Seymour Oppenheimer, M. D., New York 109

XV.—Case of Aural Suppuration Presenting Irregular Symptoms. By Edward Bradford Dench, M. D., New York 129

XVI.—A Case of Sinus Thrombosis With Extensive Accumulation of Fluid Pus in the Sinus—Recovery After Resection of the Jugular Vein. By Robert L. Loughran, M. D., New York 134

XVII.—Mechanical Aids to Hearing. By Percy Fridenberg, M. D., New York 138

XVIII.—Physiologic Vestibular Nystagmus. By J. R. Fletcher, M. D., Chicago 144

XIX.—Preliminary Report of the Improved Technic of the Thiersch Graft Following the Radical Mastoid Operation. By Cullen F. Welty, M. D., San Francisco 167

Society Proceedings 181-250

New York Academy of Medicine. Section on Otology. Meeting of October 14, 1910—A Case of Sinus Thrombosis With Extensive Accumulation of Free Pus in the Vein; Recovery After Resection of Internal Jugular—Mechanical Aids to Hearing 181-190

CONTENTS—Continued on Third Cover Page.

CONTENTS—Continued from Second Cover Page.

New York Academy of Medicine, Section on Otology, Meeting of November 11, 1910—A Case of Cerebellar Abscess Presenting Certain Features Suggestive of Labyrinthine Suppuration; Differential Points; Operation; Recovery—Demonstration and Comparison of the Various Electric Suction Massage Vibrators—A Report of a Few Cases of Otitis Media Suppurativa Treated With Suspensions of Lactic Acid Bacilli—Some Remarks on Sinus Thrombosis With Particular Reference to the Diagnostic Value of Blood Cultures in Otitic Disease 191-210

New York Academy of Medicine, Section on Otology, Meeting of December 9, 1910—A Case of Epilepsy Complicating Mastoiditis—Sinus Thrombosis—A Consideration of the Pathologic Conditions of the Ear Resulting in Profound Impairment of Hearing—Educating the Eye to Substitute for Deaf Ears 211-217

New York Academy of Medicine, Section on Otology, Meeting of January 13, 1911—Case of Gunshot Wound of the Mastoid—Gunshot Wound of Mastoid With Brain Abscess—Report of a Case of Otitic Meningitis Presenting Some Unique Symptoms—Cases of Chronic Suppurative Otitis Media Showing Results of the Yankauer Operation—The Results of the Yankauer Operation in Chronic Suppurative Otitis Media 218-236

New York Otological Society, Stated Meeting, November 22, 1910—Mastoid Operation for Persistent Pain in Mastoid Region—Result of Plastic Operation—Encephalitis Following Middle Ear Abscess—Typhoid or Malarial Fever Mistaken for Mastoid Abscess—Temporosphenoidal Abscess Complicating a Chronic Purulent Otitis Media With a Septic Temperature Range as the Only Symptom of a Diseased State—Late Mastoiditis Following Scarlet Fever With Perisinus Abscess and Sinus Thrombosis—Improvement of Symptoms in Spite of Presence of Pathogenic Bacteria in the Blood 237-250

Abstracts From Current Literature 251-274

I.—**Ear.**—The Third Contribution to the Etiology of Otosclerosis—Results of Autogenous Vaccine Therapy in Acute and Chronic Middle Ear Suppurations—Intervention Upon the Jugular Bulb—A Case Presenting Meniere's Symptoms Along With Facial Paralysis—Aural Tuberculosis in Children 251-254

II.—**Nose.**—A New Method of Operating on the Hypophysis—Ethmoidal Neurosis—A Case of Primary Tuberculosis of the Nose—Visual Fields in Accessory Sinus Disease—Four Complications and Two Deaths Following Probe Punction of the Antrum of Highmore—Immunization Treatment of Hay Fever—The Radical Operation for Chronic Maxillary Sinusitis With Local Anesthesia—Pethogenesis of Perforating Ulcer of the Nasal Septum—Consideration of the Pathogenic Theories of Ozena 254-261

III.—**Pharynx.**—A Few Facts Concerning the Cause of Failure in Adenoidectomies—The Nasopharyngeal Origin of Chorea—The Radical Tonsil Operation—Congenital Insufficiency of the Palate 262-266

IV.—**Larynx.**—Radium Therapy in Cicatricial Stenosis in the Laryngotracheal Tract—Paralysis of the Recurrent Laryngeal Nerve 266-271

V.—**Miscellaneous.**—The Treatment of Hysterical Aphonia—Epidemic Poliomyelitis—Latent Infections of the Dinhtheria Bacillus—Administrative Measures Required for Dealing With Diphtheria Contacts—Lactic Acid Ferment in the Treatment of Ozena and Otorrhea—Certain Aspects of Rhinolaryngology and Their Relation to General Medicine 271-274

Book Reviews 275-276